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WATER SUPPLY, & SANITARY IMPROVEMENT.

[Registered as a Newspaper.]

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GAS PURIFICATION
BY
OXIDE OF IRON.

COOKE BROS.,
CENTRAL DEPÔTS:
CO. DONEGAL, IRELAND;
LONDON DEPÔT:
BLACKWALL, E.;
OFFICES:
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GENUINE TORBAY PAINT
And SPECIAL GASOMETER PAINT.
Several Prize Medals. Established over 20 Years.
These Paints are now used in over 200 Country Gas-Works, and by all the London Gas Companies, on Gas-holders, Scrubbers, Purifiers, &c. Also used by the Admiralty, War Office, Railway Companies, Founders, &c. They prevent and arrest rust, and protect iron from the action of water, sulphurous and gaseous exhalations; do not crack, blister, or flake off; will cover tar effectually.
The covering powers are considerably greater than those of any other Paint.—*See "Engineer," Nov.* 2, 1866.
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CONTRACTOR FOR
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FOR
Gas, Water, & Sanitary Purposes,
AND MANUFACTURER OF
WOOD GRIDS
FOR
SCRUBBERS AND PURIFIERS.

COWEN'S PATENT FIRE-CLAY RETORTS.
JOSEPH COWEN and CO.,
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Were the only parties to whom a Prize Medal was awarded at the Great Exhibition of 1851, for "Gas-Retorts and other Objects in Fire-Clay," and they were also awarded at the International Exhibition of 1862, the Prize Medal for "Gas-Retorts, Fire-Bricks, &c., for Excellence of Quality."
J. C. and Co. have been for many years the most extensive Manufacturers of Fire-Clay Retorts and Fire-Bricks in the Kingdom. Orders for Fire-Clay Retorts of all shapes and dimensions, and to fit any shaped Mouthpiece, Fire-Bricks, and every other article in Fire-Clay, are promptly executed at their Works as above.
COWEN'S GARESFIELD COALS.
Jos. Cowen & Co. are the only Manufacturers of Fire-Bricks and Clay Retorts at Blaydon Burn.

JOHN RUSSELL & CO.,
LIMITED,
Established at the commencement of Gas Lighting,
Manufacturers of
TUBES AND FITTINGS.
THREE PRIZE MEDALS,
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Head London Office:
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OLD PATENT TUBE-WORKS, WEDNESBURY.

JOHN BENT & SON,
BELL BARN ROAD, BIRMINGHAM,
MANUFACTURERS OF
WET AND DRY GAS-METERS,
LICENSEES AND MANUFACTURERS OF
HUNT'S
PATENT COMPENSATING METERS,
STREET-LAMPS, &c., &c.
Established 1830.

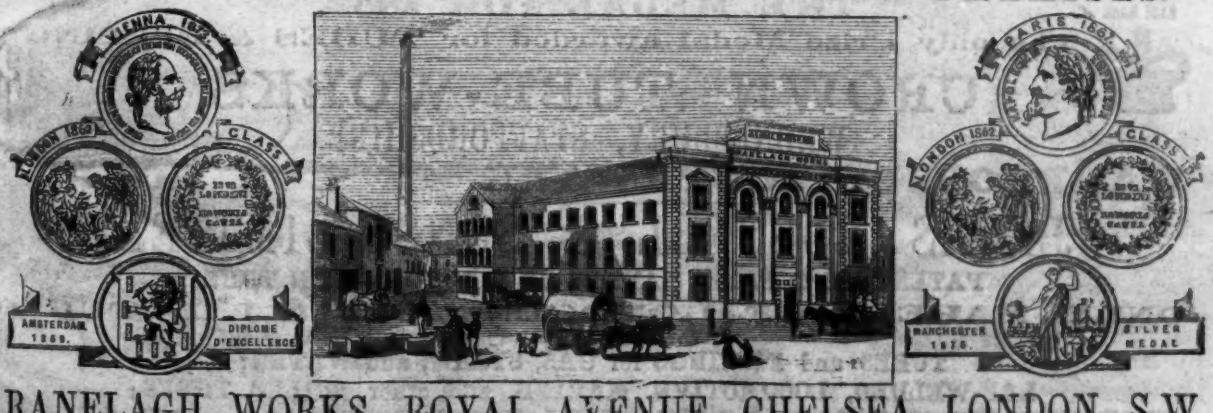
THOMAS PIGGOTT & CO.,
SPRING HILL, BIRMINGHAM,
MANUFACTURERS OF
TELESCOPIC & SINGLE GASHOLDERS,
CAST & WROUGHT IRON TANKS FOR DITTO,
And Gas Apparatus of every Description
Marine, Tubular, Cornish, Plain, Furnace, &c., and Range Boilers.
Sugar, Saltpetre, and all kinds of Pans.
Roofs, Girders, and Bridges, and General Smith's Work.
London Offices: 97, CANNON STREET—
JAMES E. & SAMUEL SPENCER, Agents.

THE
"OTTO" GAS-ENGINE.
See Page 466.

CROSSLEY BROTHERS,
MANCHESTER AND LONDON.

THE
NITSHILL COMPANY'S
DUKE OF HAMILTON'S
LESMAHAGOW
CANNEL COAL.
AGENT:
JAMES M'KELVIE,
HAYMARKET,
EDINBURGH.

CHANGE OF ADDRESS.
GEORGE GLOVER AND CO.,
DRY GAS-METER MANUFACTURERS,
HAVE REMOVED TO MORE EXTENSIVE PREMISES:



RANELAGH WORKS, ROYAL AVENUE, CHELSEA, LONDON, S.W.

SILVER MEDAL, PARIS EXHIBITION, 1867.

LLOYD AND LLOYD,

ALBION TUBE-WORKS, BIRMINGHAM,

AND

COOMBS WOOD TUBE-WORKS, HALESOWEN,

MANUFACTURERS OF

WROUGHT-IRON TUBES AND FITTINGS,

AND

LAP-WELDED IRON AND HOMOGENEOUS METAL BOILER TUBES,

UP TO FOUR FEET IN DIAMETER.

London Offices: No. 4, Cloak Lane, Queen Street, E.C.

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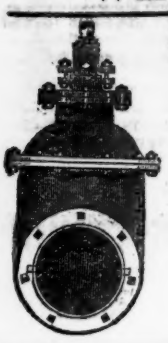
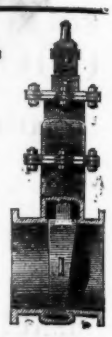


C. & W. WALKERS' DOUBLE-FACED GAS-VALVES.



These solidly constructed double-faced Gas-Valves have taken the place of the old system of the light, single-faced disc, which is too uncertain and unreliable in large bores.

They are guaranteed absolutely gas-tight. They are very massive and rigid, and by improved modes of manufacture they are produced at very little excess in cost over the old light, weak system, which is liable to spring and bend, and become leaky.

The Valve is a rigid wedge of solid cast iron, having two perfectly scraped surfaced facings fitting between the two on the body, which are also surfaced.

A spring in two short halves, and, therefore, not liable to break, is used only for scraping the front facing clean.

The front facing is vertical; the back facing forms the wedge.

At a slight additional expense both flanges are faced to bolt to main-pipes.

MIDLAND IRON-WORKS,

DONNINGTON, near NEWPORT, SHROPSHIRE; 8, FINSBURY CIRCUS, LONDON.

EDWARD E. CROMBIE & CO.,

INVENTORS AND PATENTEES

OF THE

FRICTIONLESS DRY GAS-METERS,

Beg to intimate to Gas Companies and others that they are now prepared to supply these very superior Meters at the same prices as for the ordinary Gas-Meters.

In the construction of this Meter, for which the best tin plates only are used, every mechanical contrivance has been taken advantage of successfully to reduce the friction to a minimum, which is amply proved by the fact that they are made to work upon only one-fortieth of an inch pressure. By an improvement also in their construction, a steadier light is obtained, and greater capacity than can be got from any other Meter in the market. No gas can pass under the valves on any back pressure, as is the case with many other Dry Meters.

To Gas Companies supplying gas through streets with heavy gradients, these Meters are invaluable, as much gas is saved from the low pressure required to work them.

ALL METERS ARE UPHELD FOR FIVE YEARS.

METROPOLITAN WORKS, DIANA PLACE, EUSTON ROAD, LONDON, N.W.

ROBT. DEMPSTER & SONS,

GAS ENGINEERS, IRONFOUNDERS, AND CONTRACTORS,

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MANUFACTURERS OF EVERY DESCRIPTION OF

GAS APPARATUS;

CONTRACTORS FOR THE

ERECTION OF PUBLIC AND PRIVATE GAS-WORKS.

Plans and Specifications Prepared, and Illustrated Catalogues forwarded on application.

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THE MEDAL FOR 1862.

The only Prize Medal awarded for TUBES & FITTINGS.

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HYDRAULIC TUBES, BEDSTEAD TUBES, WELL TUBES, TELEGRAPH POSTS, COILS, &c.

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IMPROVED WROUGHT-IRON RETORT-LIDS, CROSS-BARS, & SCREWS;

AND GAS APPARATUS OF EVERY DESCRIPTION.

SOLE MANUFACTURERS OF LIVESEY'S PATENT GASHOLDER MAN-LID,

By use of which Man-lid, inlet and outlet pipes can be examined and cleansed without loss of gas in crown of holder, or ingress of atmospheric air.

ROOFS, GIRDERS, BRIDGES, AND BOILERS OF ALL KINDS.

Drawings, Specifications, and Estimates supplied on application.

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MANUFACTURER OF

TELESCOPIC AND SINGLE GASHOLDERS,

WROUGHT AND CAST-IRON TANKS FOR DITTO.

PURIFIERS, CONDENSERS, SCRUBBERS, HYDRAULIC MAINS, AND ALL KINDS OF GAS APPARATUS.

WROUGHT-IRON ROOFS, BRIDGES, GIRDERS, ETC.

STEAM, HOT WATER, AND RANGE BOILERS, TANKS, CISTERNS, BOATS,

AND ALL KINDS OF WROUGHT-IRON WORK.

Drawings, Specifications, and Estimates supplied on application.

LIVESEY'S PATENT WASHER.

This apparatus effects the most intimate contact between the liquor with which it is supplied and the gas passing through it, resulting in the complete removal of all particles of tar, increasing the ammonia strength of the scrubber and condenser liquor, and removing a large proportion of other impurities—notably, carbonic acid. The Washer is intended to work in conjunction with a scrubber. It occupies little space, and is inexpensive. It has been in successful constant use for nearly three years, does not become clogged with tar or corroded by the action of the liquor or gases, it gives three inches of pressure, and only needs a supply of liquor to keep it in regular action without any further attention.

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Messrs. DEMPSTER AND SONS, ELLAND, HALIFAX, for the North;

Messrs. BAILEY, PEGG, AND CO., Bankside, LONDON, S.E., for the South;

Messrs. WILLEY AND CO., Commercial Road, EXETER, for West of England and South Wales;

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IMPROVED WET AND DRY GAS-METERS

IN CAST-IRON AND TIN CASES OF THE HIGHEST EXCELLENCE.

Original Manufacturers of Dry Meters in Cast-Iron Cases.

STATION-METERS, EXPERIMENTAL-METERS, PHOTOMETERS, & PRESSURE-GAUGES, &c.

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GAS PURIFICATION
BY
OXIDE OF IRON.
GAS PURIFICATION & CHEMICAL Co., LIMITED,
PALMERSTON BUILDINGS, OLD BROAD STREET, LONDON, E.C.

JOHN WM. O'NEILL, Managing Director.

SAMUEL CUTLER & SONS,
CONTRACTORS FOR GAS & WATER WORKS, GENERAL ENGINEERS, IRONFOUNDERS & MANUFACTURERS OF
GASHOLDERS, TANKS, PURIFIERS,
SCRUBBERS, VALVES, EXHAUSTERS, IRON ROOFS, BRIDGES, BOILERS, AND GENERAL CAST AND WROUGHT IRON WORKS.

S. C. & SONS undertake the entire erection of New, or Remodelling of existing Gas-Works in any part of the World, including small Works for MANSIONS, FACTORIES, &c., or Works of the largest extent (are now constructing the largest Gasholder yet erected); also the supplying and laying of MAINS.
They make a speciality of supplying every requisite whatever for Gas-Works, keeping in Stock what are most in request. WOOD SIEVES for Purifiers and Scrubbers, of a superior make.
SPECIAL CASTINGS to Drawing or Pattern at Shortest Notice.

Manufacturers of MORRIS & CUTLER'S PATENT CONDENSER & CUTLER'S PATENT GAS-WASHER.

DESCRIPTION OF MORRIS & CUTLER'S PATENT CONDENSER.—The Condenser may consist of pipes arranged in tiers, or in any other form most convenient to the site available, each tier being connected with special connections, and containing within same either one or more coils of smaller pipe through which water is passed, being supplied from any convenient source of supply, the water passing in an opposite direction to the gas, so that the coldest water is at the gas outlet. The power of the Condenser can be regulated precisely in proportion to the quantity of water allowed to pass through, which is not in any way contaminated, but simply heated by the hot gas, and advantage can be taken of its being at a high level to carry it to a high-level cistern, from whence it can be used for supply to boiler or any other purpose. The Condenser itself may form the support for a high-level cistern. By an arrangement of valves the water may be shut off, and an air orifice opened, when air will pass through instead of water, or both air and water can be shut off. The power of the Condenser is, therefore, entirely under control. The Condenser may be seen in operation at the Brentford Gas-Works.

For further Particulars, apply to Mr. F. MORRIS, GAS-WORKS, BRENTFORD, or to
S. CUTLER & SONS, PROVIDENCE WORKS, MILLWALL (Near the Steamboat Pier), LONDON, E.

1862.

CLASS II.

HALLETT'S
PATENT ANTIMONY PAINT.
MADE ONLY BY
GEORGE HALLETT & CO.,
296, ROTHERHITHE, LONDON, S.E.

Price 30s. per Cwt. Special Driers supplied at same Price.

This light stone-coloured Paint, for which a Prize Medal was obtained in 1862, is free from certain defects of white lead. It does not produce any deleterious effect upon the health of those who use it, such as painter's colic, nor is it blackened by sulphur compounds in the atmosphere; while, from its less specific gravity and good body, it covers more surface, weight for weight, and, therefore, it is preferable and more economical than white lead.

It is peculiarly adapted for Gas-Works.

GOLDSMITH'S PATENT SIGHT WATER-LINE INDICATING GAS-METER.
MANUFACTURED BY GUEST AND CHRIMES,
FOUNDRY AND GENERAL BRASS WORKS,
ROTHERHAM;
AND 85, SOUTHWARK ST., LONDON, S.E.

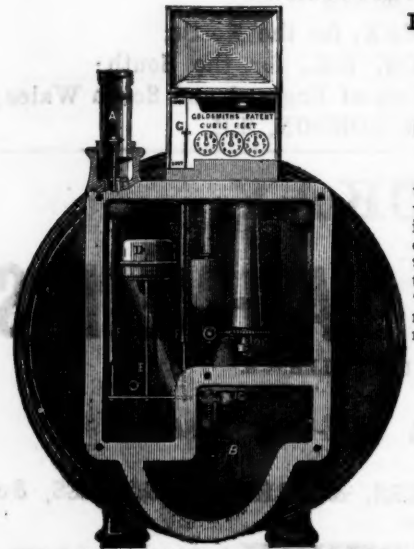


FIG. 1.—Three-light Meter, One-sixth Size.

Fig. 1 is a Meter with front removed to show the arrangement and connection of the Indicator and Valve.

Fig. 2 is front view of Index, with cover up.

The principal object of this invention is to render the water-line in the reservoir at all times visible. It will be seen, by reference to the illustrations, that this is accomplished in the following manner:—On the dial are the words "Open" and "Shut," and attached to the float is the pointer G, which rises and falls with the water-line in the reservoir. If the pointer is at "Open," it shows that the valve is open, and that the reservoir is full. If it is at "Shut," it shows that the reservoir is empty, and that the gas will be shut off.

The following ADVANTAGES will be obvious:—

1. The Inspector can see at a glance if the Meter requires water.
2. No more water than is required need be added, and therefore no water has to run out.
3. The Meter Inspector will be spared a great deal of his most objectionable work, and he will save a great deal of time and trouble.
4. The consumer will not always have to be asked for water, nor will he have to endure the unpleasant smell caused by waste water being run out.

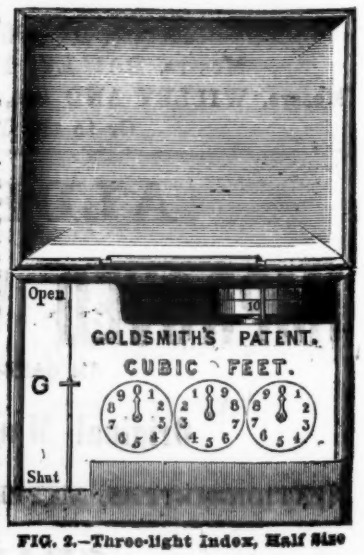


FIG. 2.—Three-light Index, Half Size

GEORGE ORME & CO.,

ATLAS METER-WORKS, OLDHAM,

MANUFACTURERS OF

WET AND DRY GAS-METERS,

STATION-METERS, GOVERNORS,

PRESSURE AND EXHAUST REGISTERS,

LAMP-METERS IN CAST-IRON BOXES,

And every Description of Gas Apparatus.

JAMES MILNE & SON,

GAS ENGINEERS,

Gas-Meter, Gas Apparatus, and Gas-Fittings Manufacturers,

EDINBURGH, AND

2, KING EDWARD STREET,

NEWGATE STREET, LONDON.

Meter Works in London—2, CROSS STREET, WILDERNESS ROW, E.C.

STATION-METERS GOVERNORS, CONSUMERS METERS, GAS LUSTRES, CHANDELIERS, BRACKETS, &c.,

And every description of Gas-Fittings and Gas Apparatus.

J. & J. BRADDOCK,

GAS ENGINEERS,

GLOBE METER-WORKS, OLDHAM,

MANUFACTURERS OF

WET & DRY CONSUMERS GAS-METERS,

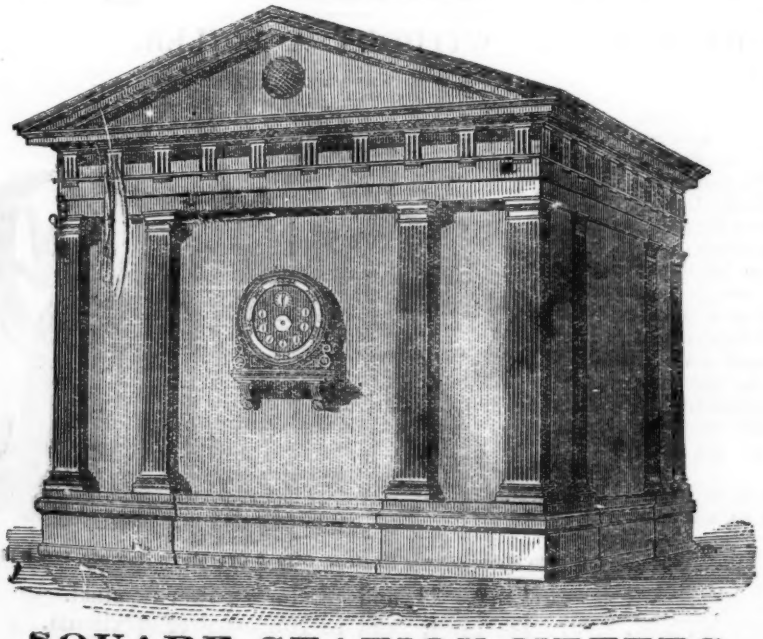
OF THE HIGHEST EXCELLENCE ONLY;

ALSO LICENSEES AND MANUFACTURERS OF

WARNER & COWAN'S PATENT SELF-REGULATING GAS-METERS;

ROUND STATION-METERS,

ON CAST-IRON STANDS.



SQUARE STATION-METERS,

WITH PLANED JOINTS.

GOVERNORS, GAUGES, INDICATORS, MAIN COCKS, &c.

GAS COOKING APPARATUS.

Home and Foreign Orders promptly attended to.

Stock of CONSUMERS METERS, STATION-METERS, and GOVERNORS generally in Stock.

Orders almost invariably despatched on the day of receipt.

TERMS, &c. ON APPLICATION.

C. & W. WALKER'S

WOOD PURIFIER SIEVES,

Which have now been used for fifteen years, and their advantages and durability fully established. They are made entirely by steam machinery in very large quantities at the most moderate cost.

MIDLAND IRON-WORKS,
DONNINGTON, NEAR NEWPORT, SHROPSHIRE.
FINSBURY CIRCUS, LONDON.

ESTABLISHED IN 1860.

BENJAMIN CARPENTER,

THE ORIGINAL MANUFACTURER OF THE IMPROVED

WOOD SIEVES

FOR

GAS PURIFIERS & SCRUBBERS.

PROVIDENCE WORKS,
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MOBBERLEY & PERRY,

FIRE CLAY and BRICK WORKS,

STOURBRIDGE.

Proprietors of
BEST GLASS-HOUSE POT and CRUCIBLE CLAY.
Manufacturers for Home and Export.
GAS-RETORTS, GLASS-HOUSE FURNACE,
BLAST-FURNACE, TANK BRICKS, LUMPS, TILES,
And Every Description of Best Fire-Bricks.

JOHN ROMANS, C.E., F.G.S.E.,

CONSULTING GAS ENGINEER

AND

CANNEL COAL FACTOR,

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Plans and Estimates furnished; Gas-Works, Apparatus, Pipes, Machinery, Fire Goods, &c., supplied, or Attested and Shipped for Exportation.

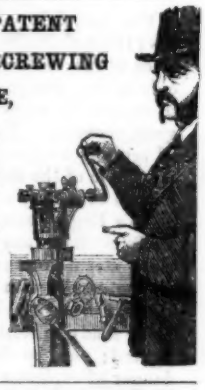
GAS-WORKS TAKEN ON LEASE.

Mr. ROMANS has for upwards of 30 years been practically engaged in the Manufacture of Gas, and has, by extensive experiments, ascertained that by JUDICIOUS INTERMIXTURE of the lighter with the heavier gases, much of the rich Hydrocarbons CAN BE SAVED, which otherwise ARE LOST, during the process of manufacture. He is therefore enabled to give advice to those who favour him with their orders for Cannel, as to the class which will secure for their standard of illuminating power the HIGHEST ADVANTAGEOUS RESULTS.

ANALYSIS AND PRICES FORWARDED ON APPLICATION.

GRIRDROD'S PATENT

PORTABLE PIPE SCREWING MACHINE,



For 1 in., 1¼ in., 1½ in., and 2 in. Gas Threads, complete £7 10s.

In use at the chief gas-works, and giving great satisfaction.

For other useful goods, see Bailey's "Illustrated Inventions," post free 3s. 6d.; gratis to ledger customers.

W. H. BAILEY & CO.,

Brassfounders, Gauge Injector and Tool Makers,
ALBION WORKS, SALFORD,
LANCASHIRE.

Gold Medal Awarded, Paris Exhibition, 1878.

THOMAS TURTON AND SONS,

SHEAF AND SPRING WORKS,

SHEFFIELD,

MANUFACTURERS OF

FILES OF BEST QUALITY FOR ENGINEERS,

STEEL OF ALL DESCRIPTIONS,

SCREW STOCKS, TAPS, AND DIES, SPANNERS
RATCHET BRACES, LIFTING-JACKS,
ANVILS, VICES,
AND ENGINEERS TOOLS GENERALLY.

LONDON OFFICE:

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R. W. WINFIELD AND CO.,

CAMBRIDGE STREET WORKS AND ROLLING MILLS,

BIRMINGHAM.

The following Medals have been awarded:—

GRAND COUNCIL MEDAL, LONDON, 1851. MEDAL, LONDON, 1862. GOLD MEDAL, PARIS, 1867,

The only Gold Medal awarded for "Apparatus and Processes for Heating and Lighting" by the Imperial Commissioners.

MEDAL FOR PROGRESS, VIENNA, 1873.

The following Medals were also awarded at Paris, 1878:—

GOLD MEDAL for Chandeliers and Gas-Fittings.

GOLD MEDAL (Rappel) for Metallic Bedsteads and Furniture.

GOLD MEDAL (Rappel) for Art Metal Work. BRONZE MEDAL for Tube Metal and Wire.

MANUFACTURERS OF BRASS AND COPPER SHEETS,

TUBE AND WIRE,

ROLLED METALS, LOCOMOTIVE AND CONDENSER TUBES, CYLINDERS;

Ornamental, Taper, and Cased Tubes; Tin Tubes;

GAS-FITTINGS, CHANDELIERS,

BRACKETS FOR HEATING AND LIGHTING;

METALLIC BEDSTEADS.

Ecclesiastical and Mediæval Metal Workers.

GENERAL BRASSFOUNDERS.

REGISTERED TRADE MARK:

R. W. W. & CO.

LONDON OFFICES & SHOW-ROOMS: 141, FLEET STREET, E.C.

THE

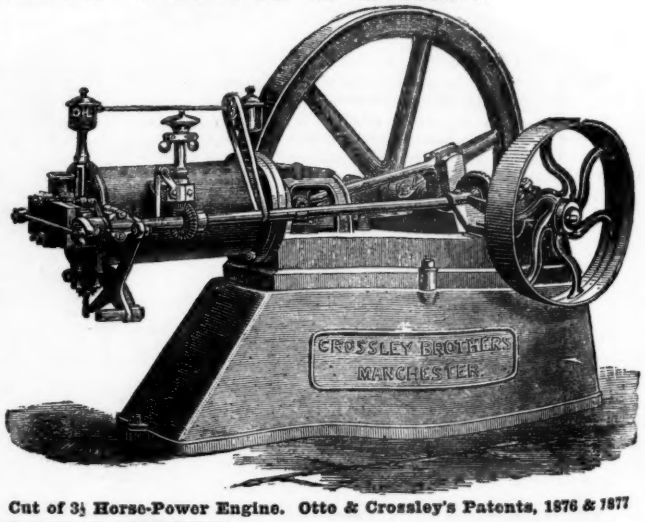
New "OTTO" Silent Gas-Engine.

AN ENGINE WHICH WORKS WITHOUT A BOILER.

The principle of combustion in this Gas-Engine is ENTIRELY NEW. In it an explosion does not take place in the ordinary meaning of the term. A small part only of the charge is combustible, which on ignition serves to expand the remainder, thus avoiding shock and effecting great economy. The Engine is also alone in the peculiarity of igniting its charge at the *beginning* of the stroke, leaving the whole of the stroke for effecting expansion of the gases, instead of merely a fraction as in obsolete constructions.

This Engine has a SMALLER NUMBER of MOVING PARTS than any other Gas-Engine; or, indeed, than many steam-engines. It is almost as silent as a steam-engine, works with the same smoothness and regularity of speed, and has the immense additional advantages of always being ready to start at full power at once on the gas being lighted; and, by dispensing with the boiler, of avoiding the danger of explosion, increased rates for insurance, expensive attendance, and all the annoyance which the use of a boiler entails.

Where work is intermittent, trouble with a small steam-engine and boiler is at its maximum, but at its minimum with a Gas-Engine.



Cut of 3½ Horse-Power Engine. Otto & Crossley's Patents, 1876 & 1877

Sizes at present offered . . . . . 1, 2, 3½, and 8 Horse-power nominal.
Being equal to about . . . . . 1½, 2½, 4, and 12 Horse-power maximum.
Cost of Gas, One Penny per hour per indicated Horse-power, at 4s. per 1000 cubic feet.

PRICES, LIST OF USERS, AND BOOK OF SEVENTY TESTIMONIALS, ETC., ON APPLICATION TO

CROSSLEY BROTHERS,

WORKS: GREAT MARLBOROUGH STREET, MANCHESTER.

LONDON WAREHOUSE: 116, QUEEN VICTORIA STREET, E.C.

SOLE ENGLISH AND COLONIAL MAKERS.

TANGYE BROTHERS AND HOLMAN,

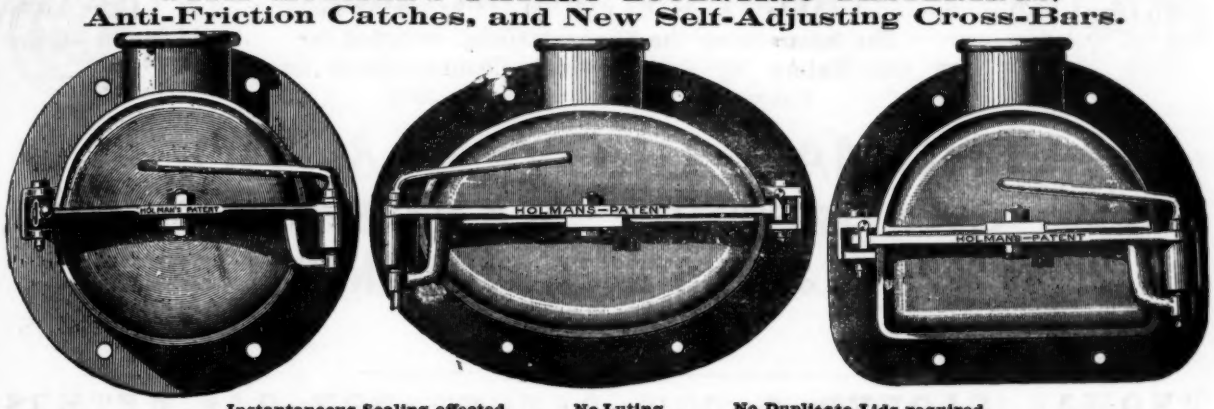
CORNWALL HOUSE, 35, QUEEN VICTORIA STREET, LONDON, E.C.,

(LATE OF 10, LAURENCE POUNTNEY LANE.)

SOLE MAKERS OF MORTON'S PATENT SELF-SEALING RETORT-LIDS,

WITH HOLMAN'S PATENT ECCENTRIC FASTENINGS,

Anti-Friction Catches, and New Self-Adjusting Cross-Bars.



Instantaneous Sealing effected. No Luting. No Duplicate Lids required.

Holman's New Self-Sustaining Cross-Bar ensures freedom of Joint, and maintains parallel position of the Lids.

Since their introduction in 1869, these Patent Retort-Lids have been thoroughly tested, being now in use in nearly all the principal Gas-Works in London and the Provinces.

T. B. and H. are now making the "Morton's Self-Sealing Lid" of the SAME FORM OR SECTION AS THE RETORT (see Illustrations above), as well as bringing the Mouthpiece from the D or Oval at back to Circular in front, as heretofore.

D and Oval Morton's Lids are working satisfactorily both in this country, on the Continent, and in the United States of America. Among others they have been adopted by the following Gas-Works:—

The Gaslight Company's Works, Fulham; Ditto, Bromley-by-Bow; Ditto, King's Cross; Ditto, Shoreditch.
And also in the Gas-Works at Richmond, Maidstone, Gloucester, Glasgow, Portsea, Roubaix (France), The Hague (Holland

HUNT'S PATENT EQUILIBRIUM GAS-GOVERNOR.

In this Governor a Throttle-Valve is substituted for the ordinary suspended Cone, all external communications being avoided by placing the Lever or Radius Arm (shown in the drawing) inside the Valve-Chamber upon the Disc. The Disc is carried upon steel centres, upon which it is accurately balanced and turns freely. The friction in working is thereby reduced to a minimum. This Governor is extremely sensitive to alterations of inlet or outlet pressure, and renders a large actuating holder unnecessary.

The principal advantages of this arrangement over the ordinary form of Governor are as follows:—

Its sensitive action prevents oscillation.

It is self-adjusting—*i.e.*, it maintains a steady pressure under variations of inlet pressure or a fluctuating consumption.

The inlet to Gasholder being contracted to the smallest possible dimensions, all danger from leakage through insufficiency of seal, tilting, &c., is entirely avoided.

The valve portion being separate from the holder, it can be handled and fixed like an ordinary Slide-Valve direct in the main; and the holder can be placed at an convenient distance immediately above it. The cost is thus materially reduced, and the inconvenience of heavy lifts done away with.

There are no working parts likely to get out of order.

These Governors have been adopted by many leading Gas Companies, among whom are the following:—

The Gaslight and Coke Co. (9), The London Gas Co. (3), and at Abergavenny, Arundel, Birmingham, Cannes (France), Devonport, Dursley, Exeter, Guernsey, Halesowen, Mentone (France), Monmouth, Newcastle-on-Tyne, Oxford, Plymouth, Rochdale, Windsor, &c.

TESTIMONIAL.

The Gaslight and Coke Company,
9, Water Street, New Bridge Street,
Blackfriars, E.C., Feb. 27, 1878.

MESSRS. TANGYE BROTHERS AND HOLMAN.

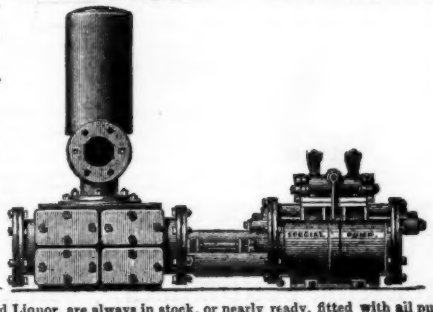
Gentlemen,—The two 24-inch and three 36-inch Hunt's Equilibrium Governors supplied by you, and fixed in the valve-rooms at Whitechapel, Goswell Road, and Blackfriars, are working very satisfactorily.

Yours truly,
(Signed) JOHN JOHNSON.

PRICES AND FULL PARTICULARS ON APPLICATION.

THE "SPECIAL" STEAM-PUMP.

Diameter of Steam Cylinder.	Diameter of Water Cylinder.	Length of Stroke.	Gallons of Water per Hour, Approximate.	Reduced Prices.
3	1½	9	450	£16
4	2	9	815	18
5*	2½	12	1,250*	20
5*	3	12	1,830*	22 10
4	4	12	3,250	25
6*	4	12	3,250*	30
5	5	12	5,070	32 10
7*	5	12	5,070*	40
6	6	12	7,330	40
8*	6	12	7,330*	50
7	7	12	9,750	50
10*	7	12	9,750*	65



In use in a Hundred Gas-Works in the United Kingdom for Pumping Ammoniacal Liquor, Water, or Tar.

Messrs. Burt, Boulton, and Haywood, Manufacturing Chemists, have over FORTY "Special" Steam-Pumps in use at their several large Tar-Works.

Two Hundred Sizes made. Those in Table opposite are the leading Sizes for use in Gas-Works and Chemical Works.

* These Sizes being usually selected for pumping Tar and Liquor, are always in stock, or nearly ready, fitted with all pump details in iron, and extra length distance-piece between steam and pump cylinder, at a small extra cost.

TANGYE'S HIGH-PRESSURE AND CONDENSING STEAM-ENGINES; CORNISH, VERTICAL, & TUBULAR BOILERS; HYDRAULIC AND SCREW LIFTING-JACKS, CRABS, PULLEY-BLOCKS, &c.

FULL PARTICULARS, ESTIMATES, CATALOGUES, ETC., ON APPLICATION.

London, 1851. New York. 1853. Paris, 1855. London. 1862.

Dublin, 1865.

The SIX MEDALS AWARDED to THOMAS GLOVER for

PATENT DRY GAS-METERS,

The latter being the Highest Medal awarded for Dry Gas-Meters by the Imperial Commissioners for the Universal Exhibition, Paris, 1867.

Paris, 1867.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

214 TO 222, ST. JOHN STREET, CLERKENWELL GREEN,

LONDON, E.C.

THOMAS GLOVER & CO.'S PATENT DRY GAS-METERS.

1st, Are a remedy for all the defects of Wet Meters;
2nd, Are suitable for all climates, whether hot or cold;
3rd, Incur no loss of Gas by evaporation;
4th, Cannot become fixed by frost, however severe;
5th, Are the most accurate and unvarying measurers of Gas;
6th, Prevent jumping or unexpected extinction of the Lights;
7th, May be fixed either above or below the level of the Lights;
8th, Cannot be tampered with, without visibly damaging the outer case;
9th, Will last much longer than Wet Meters;
10th, Will not cost more than one-half for repair that Wet or Water Meters do;
Are upheld for five years without charge.

WILLIAM PARKINSON & CO.

(ESTABLISHED 1816.)

ARE THE ONLY MAKERS

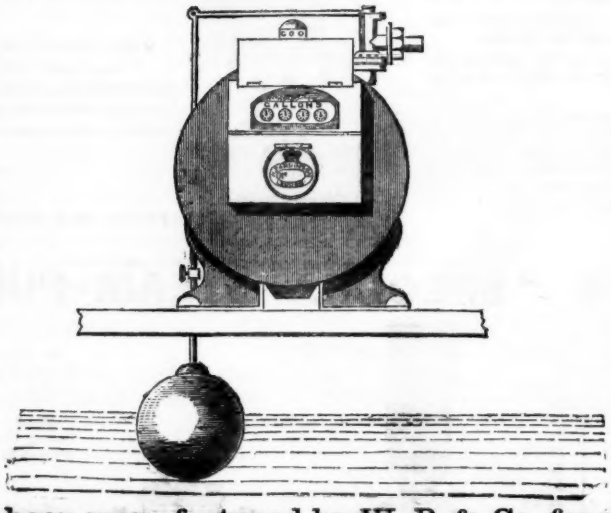
OF THE

LOW-PRESSURE WATER-METER.

These Meters will register with perfect accuracy, either at full speed, or with a few drops only passing through them.

They must be placed over the cistern to be supplied, and the water, after being measured, will fall from the outlet into the cistern below. Each Meter is fitted with a ball-valve, so made that it can be adjusted to shut off the supply at the inlet when the water reaches any required height in the cistern.

The 100-gallon Meter is fitted with a cistern holding about three or four gallons, and may be fixed inside a house, free from the effects of frost, and requires no attention after once being fixed.



From "The Engineer," April 6, 1877.

"Low-pressure Meters have been found to register with almost perfect accuracy, or, at all events, within 5 per cent. either for or against the consumer, and from the nature of their construction are by no means easily deranged. Still, even the low-pressure meters have their disadvantages, but these are chiefly as respects the question of first cost, seeing that they must have a cistern fixed at a higher level than that at which the supply is needed. All things considered, however, the balance of opinion rules at present in favour of the low-pressure Meter, and they are consequently increasing in favour as time goes on."

These Meters have been manufactured by W. P. & Co for more than 25 years, and are largely used by the following and other Water Companies:—

NOTTINGHAM, DERBY, LEICESTER, SUNDERLAND, GREAT YARMOUTH, SHEFFIELD, NORWICH, LOWESTOFT, COVENTRY, SOUTHEND.

COTTAGE LANE, CITY ROAD, LONDON, E.C.

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TO CORRESPONDENTS.

E. O.—*Received; but not suitable for our columns.*
RECEIVED.—*G. B. (Leeds), J. D. (Glossop).*
WOOD GAS.—*We cannot, at this moment, furnish any information on this subject. We will, however, bear the matter in mind.*

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, APRIL 1, 1879.

Circular to Gas Companies.

THE light of the Société Générale d'Electricité is to receive a more extensive trial at the hands of the Metropolitan Board of Works. The Société have agreed to put up twenty more lights on the Victoria Embankment, which will carry the string of lamps up to Blackfriars Bridge, and to find everything necessary for producing the illumination at a charge of fivepence per lamp per hour. We had occasion to remark, a few weeks back, on the authority of a gentleman well acquainted with the Société's affairs in Paris, that they have never made a profit in that city. It will require, it seems, two dynamo-electric machines to furnish the additional lights with electric force, and two steam-engines, or one of sufficient power to drive both, in which latter case the length of cable required might constitute a difficulty. We may take it that two separate engines will be required at different stations on the Embankment, and, considering the expenses involved for the engines, machines, and all the accessories, we feel very confident that the Société will make no profit out of the Metropolitan Board of Works.

While writing on this subject, we may just mention that Mr. Killingworth Hedges has published an appendix to a pamphlet which we noticed some time ago, "On the London Gas Com- "panies and the Electric Light." His object, in this appendix, is to answer the report of the Committee of the Directors of the Chartered Company, on the experiments made with the electric light at their offices in the Horseferry Road; and his aim is to prove that the cost of the new light, as set out in their report, is very much too high, in comparison with the cost for gas. But there is, we think, this to be said in reply to Mr. Hedges—namely, that the statements made in the report of the Company were based upon actual experiment, while the tables of Mr. Hedges are founded upon mere guesses. We want something more than these to settle the relative cost of the electric as compared with that of gas light; but it really does not matter. While two engines and two dynamo-electric machines are required to furnish the force necessary for twenty lights, Gas Companies can afford to laugh at the enormous waste of energy and money.

A rather extensive series of experiments with the electric light and with dynamo-electric machines has been made at Bristol, under the auspices of the Pyramid Electric Lighting Company. Nearly all the known electric lamps were displayed, including the Company's. The effects were said to be extremely good, and it is, of course, boasted that the light produced is very cheap—only twopence halfpenny per light per hour. A large amount of power was employed, the cost of which we should think was considerable. Two large and two small Gramme machines, driven by what horse-power engines we are not told, were used. It is right, however, to say that all the force was not employed in producing the electric light, for one of the large Gramme machines actuated a chaff-cutter placed on the opposite side of the river to that of the engine. We may just mention *en passant* that this latter experiment was intended to show how the force of the Niagara Falls might be utilized in taking a stream of electricity to New York.

The Board of Trade, we notice, have taken up the resolution dropped by Mr. Raikes. On the motion of Viscount Sandon, made on Friday last, a Select Committee was appointed to consider the desirability of authorizing Municipal Corporations or other Local Authorities to adopt any schemes for lighting by electricity, and also to consider under what conditions Gas and other Public Companies should be allowed to supply the light. We are rather glad that an inquiry is to take place. The scope of the Committee now appointed is not quite so extensive as that moved for by Mr. Raikes; but no doubt sufficient evidence will be obtained to show that, in all probability, it will be long years before electricity can come into competition, on equal terms, with gas. Will it ever? We shall probably learn Dr. Lyon Playfair's opinion on the matter, when we have the report of the Select Committee. Not wishing to suppress any fact which we consider of importance, we may here mention, that M. Jamin, one of the most distinguished physicists in France, has invented a mode of electric lighting. Of this we are certain to hear more, for the Société Générale have taken the matter in hand.

The report of the Directors, and the accounts of the Commercial Gas Company, for the half year ending Dec. 31, 1878, are before us. It is hardly necessary to say that both are of an eminently satisfactory character. It must be so, for the district of the old Commercial Company is rapidly developing, and the consumption of gas is largely increasing. For example, in the past half year, the total quantity of gas sold by the Company amounted to 661,090,000 cubic feet, while in the corresponding half of the previous year the sale was only 615,367,000 feet. The revenue, of course, shows a corresponding increase. The sale of gas in the past half year brought £115,053, while in 1877 the sum realized was only £107,221. The profits applicable to dividend, after paying the forfeiture of £250, incurred by an excess of sulphur in the past half year, and in relieving the Shareholders of income-tax, allowed of the payment of ten and a half per cent. on the old stock, and seven and a half on the new. The standard price of gas in the case of the Commercial Company, it must be remembered, is 3s. 9d. per thousand feet, but only 3s. 5d. is charged. Thus a dividend of eleven per cent. would be justified; but the Directors very properly prefer to add the balance of net profit of the past year, amounting to £3026, to the balance brought forward from previous years, making the total unappropriated balance £16,791.

The Leamington Gas Company have had a very successful half year's working. Their district is excellent, and the only thing to be regretted is that it does not fill up more rapidly. Notwithstanding certain—we cannot call them adverse circumstances, for they are simply the result of want of progress in the neighbourhood, the profits of the Company are sufficient to pay

maximum dividends, together with a bonus of 4s. per share on the original stock, in liquidation, we may take it, of past deficient dividends, and also a full dividend of seven per cent. on the new share capital. After paying these, there remains a balance to be carried forward of £8144. Under such prosperous circumstances, the Directors wisely promise a reduction of threepence per thousand feet in the price charged within the town, and sixpence per thousand beyond. This latter considerable reduction will, we hope, stimulate the consumption of gas outside Leamington. We are glad to see that the Company propose to make a display of one of Mr. Sugg's new burners, with a view of showing that gas can compete with the electric light, which latter, we rather think, has never been exhibited in Leamington.

It is gratifying to see that these large improved gaslights of Mr. Sugg are rapidly finding their way all over the country. We recently read of the display of one at Sheffield, which was highly approved of. Now we hear of another in Southampton, which is also much admired. The Town Council of Southampton, anxious to improve the gas lighting in the Borough, have placed six-feet burners in lieu of four-feet ones, which, combined with the use of Skelton's catoptric lanterns, has much improved the lighting of the High Street. The British Gas Company have also introduced the new lamp and burner into Hull, where it attracts much attention.

It is worthy of remark that all the experiments with the large burners are being made at the Gas Companies expense. They will very probably be regarded as trade advertisements, and, perhaps, it may be right to call them so. But, after all, the question whether or not this kind of advertisement will bring profit to the Companies is a matter which will have to be decided hereafter. The cost of these new lights, of enormously increased illuminating power, is relatively very small; but, unfortunately, it is in excess of the expense entailed by the ordinary system of street lighting, and therein lies the difficulty. Local Authorities make what we may call a pretence of keeping the rates under, and, consequently, they screw down the price of gas, and limit, as far as possible, the consumption of gas in the public lamps. There is, we believe, a considerable difference between economy and niggardliness. The St. Pancras Vestry resolved, two or three years ago, on reducing the cost of gas to their parish, with which idea they—sensibly or not—adopted the average meter system. Their next step was to lessen the hours of consumption. So effectually have they done this, that in the earlier part of the dark evenings which have prevailed during the last month or so, we, who have to make our way through a part of the parish, have noticed a great deficiency of light in the streets. When a Vestry take the public lighting into their own hands, they should have regard, not merely to the hours of sunset and sunrise, but to the varying wants which arise from meteorological causes. At the present time, parts of St. Pancras are not at all illuminated, and our astonishment is that collisions have not occurred in certain thoroughfares, which would have landed the parish in heavy law charges.

The accounts of the Limerick Gas Company for the past year have been published, and the Directors consider that the results of the year's working of the undertaking have been "comparatively satisfactory." A dividend of only three and three-quarters per cent. has been declared, which, when paid, will leave a balance of nearly £1781 to be carried to the next account. Considering the position in which the Company now stand, another one per cent. might as well have been paid. The Corporation of Limerick, as our readers know, have authority to purchase the undertaking, the price agreed upon for the transfer being £54,000. But the credit of the Corporation is not good, and they cannot raise £54,000. It is, however, reported that the National Bank of Ireland have agreed to advance £30,000—we presume, in part payment for the undertaking. What the Company will say to this we have not been informed. The paid-up capital is £36,000, and, considering all the circumstances, the Shareholders may rejoice to be quit of the concern for £54,000. So far as we are able to judge of the accounts, the working of the undertaking has been of a very satisfactory character.

The gas accounts of the Corporation of Leeds have been issued. They show that during the past year the gas undertaking has brought to the Corporation a net profit of £7434. The receipts for gas and meter rents amounted to £141,076—a considerable increase over the receipts of the previous year. A good deal of expenditure has been incurred for re-laying mains and services, and for repairs; but these sums have been well laid out. More, perhaps, might have been expended with advantage in adapting the capacity of the mains to the wants of the borough and district. We shall have more to say when these accounts have been discussed at a meeting of the Town Council. All we have now to add is, that the Corporation of Leeds are to be congratulated upon the present success of their gas undertaking.

A commencement has been made of the extensive additional gas-works for the Bristol Gas Company, to be erected in the Stapleton Road. These works, when completed, will occupy an area of thirty-six acres, which, as the Company have secured over forty acres, will leave room for further extensions. The new works have been planned by Mr. Walter Fiddes, the well-known Engineer of the Bristol Gas Company, and will be carried out by Messrs. J. Aird and Co., under the superintendence of Mr. William Fiddes. Considering the amount of work to be done, we are somewhat astonished to find that the Contractors have entered into an obligation to have the works in a condition to make gas on the 1st of November next. There is no doubt, however, knowing the resources and energy of the firm, that the obligation will be strictly fulfilled. The works were commenced by laying the foundation-stone of a gasholder-tank, which is to have the diameter of 162½ feet. It is to be of brick, and will be furnished with a telescopic holder, capable of containing 1,250,000 cubic feet of gas. In our next issue we shall lay before our readers further particulars respecting these important works, and at some future time we hope to be able to give drawings and plans of them.

Gas Companies, on the whole, are succeeding very well with their Bills in the House of Commons. The Brighton and Hove Gas Company's Bill passed through Committee with scarcely any alterations, notwithstanding the fact that it had to encounter the strong opposition of the Corporation of Brighton and the Shoreham Harbour Commissioners. The section which was intended to give the Company power to supply the electric light was withdrawn, and also that to enable them to supply apparatus, gas-engines, &c. The Company, however, have obtained all they really desired. The Glossop Gas Company also succeeded with their Bill, in spite of strong opposition, few alterations having been made in its provisions.

An interesting exhibition of gas apparatus has been held at Keighley, and gave much satisfaction. In face of such valuable information as is furnished to us in the papers on "Gas as Fuel," by "Isca"—and particularly with reference to the communication printed in our issue of to-day—these exhibitions assume a special interest. Our contributor shows that gas is a most economical fuel when it is used to evaporate water, whether for culinary purposes or for the production of motive power. Of course, it stands to reason that, with proper arrangements, gas must be equal to other fuels for more extensive uses. We shall not anticipate our contributor in his conclusions of the value of gas as fuel for warming apartments. His calculations will, no doubt, establish the truth of our practical experience, that gas used for warming an entire house, and furnishing all the heat necessary for every culinary operation, in addition to supplying light as well, is economical. With a knowledge of an almost palatial residence, in which gas alone was used, both for heating and lighting purposes—not a grain of coal being consumed in the establishment—we have the assurance of the proprietor that a large amount of economy resulted, notwithstanding the fact that the price of gas in a continental city largely exceeds that in our own. We shall have occasion presently to notice some other exhibitions which have been held in the North. To say the truth, a good deal of sameness attends these displays. This, however, does not detract from their usefulness; it only deprives us of the opportunity of giving fuller accounts of the exhibits.

The "Summer Instructions" of the Metropolitan Gas Referees have been issued. They are of the usual character, but, of course, as regards consumers and companies, much depends on the efficiency with which these Instructions are carried out. Their plan is excellent, and everything, so far as Gas Companies and Consumers are concerned, is dependent upon the faithful discharge of the duties they impose. So far as we notice, no alterations are made, except those usual in the case of the amount of sulphur impurity allowed for the summer months. As usual, gas made at Beckton, Bow, and Bromley is not to contain more than fifteen grains of sulphur in one hundred cubic feet of gas. For all other stations under their superintendence, twenty grains are permitted.

Water and Sanitary Notes.

We cannot say that the Chemical Section of the Society of Arts has been a great success. The papers read before it have been, no doubt, up to the Society's average standard, but that is not saying much. One which was read at the last meeting, on "The Injurious Effects of the Air of Large Towns on Animal "and Vegetable Life, and Methods Proposed for Securing "Salubrious Air," might, from the title, have promised very much interest; but there was really nothing in it, and no one but

the Chairman of the evening, who was really the Secretary of the Section, took any notice of it. And yet the subject is one of supreme importance. What is it that causes increased mortality in large towns? It is certainly not carbonic acid, nor is it soot, which, though dirty, is probably quite innoxious to animal, if not to vegetable life. The imperfect combustion of coal in domestic fireplaces is at once a nuisance and a waste; but how are these to be avoided? The author whose paper we notice, proposes, in order to make the air "salubrious," the use of an arrangement devised years and years ago by Mr. Peter Spence, of Manchester, who suggested the connection of all domestic chimneys, by means of the sewers, with a central shaft of great altitude. Mr. Spence was never, to our knowledge, wildly jocose; but when he made this proposal he must have been in his most amusing mood. Beyond this, the paper we notice was simply made up of a collection of analyses by that veteran chemist and sanatarian, Dr. Angus Smith, F.R.S., who, we are certain, would not endorse all the views expressed by the author. If Mr. W. Thomson wishes for a subject which well merits a searching investigation, he will find it in the examination of the air of large towns, both chemical and microscopical; but we may warn him that he has no mean task before him. A lifetime of labour directed by intelligence, may, perhaps, bring him to the threshold of some discoveries of great importance to humanity.

The delegates from the Vestries and District Boards who meet in the Vestry Hall of St. Martin's-in-the-Fields had another *séance* last Thursday, under the presidency of Mr. E. J. Watherston. As a matter of course, the chief accusations brought against the Water Companies by their opponents are, first of all, that they have the opportunity of charging what some people are pleased to call exorbitant rates. It is not often said now that the Companies charge up to the hilt, but still the fact is looked on with suspicion, especially in these days when the Water Companies have the power of charging upon full annual value. That is one argument of the grievance-mongers. The next is, that the supply is what we may call fragmentary—that is to say, the various Water Companies have different arrangements. We cannot combat this argument, for, as our readers know, we have constantly and consistently advocated a coalition among the Companies, with a view to unity of management and the combination of interests. To our minds, amalgamation would produce infinitely better results than would come of management by a Commission—Royal or other. We know now how these are usually constituted. A military officer or two, who can write R.E. after their names, and a doctor who has never seen much practice, would probably be selected to manage the water affairs of the Metropolis. There would be plenty of able advisers about them, and the "able advisers" might as well manage the "united" undertaking, and save the Metropolitan ratepayers a great deal of expense. Mr. Watherston does not seem to see this. He can find no virtue in a Water Company, and would apparently prefer to have them entirely abolished.

The examination of water, if it be confined to the determination of the amount of what is called organic matter, is, as we have often said, a very simple business. We can find organic carbon, nitrogen, and albumenoid ammonia with ease; and we can also tell, to any number of decimal places, how much oxygen is required to oxidize the organic matter in a gallon of water. But, when we know all this, what have we really learned of the quality of the water, and its possible influence on the spread of disease? Just now there is a great outcry about the appearance of typhoid at Redhill. The district is supplied with chalk water from the Caterham deep wells. How, when, and where the poison of typhoid obtained access to the water-mains nobody seems to know. It appears to be another of those cases in which, when an epidemic breaks out, and doctors can find no other excuse for its appearance, the water supply is immediately fixed upon as the criminal. A Medical Inspector of the Local Government Board has been down, we understand, to make an inquiry; but we are told, he sat with closed doors, and the conclusions he arrived at have not been made public. This, however, would appear to be an important case, which deserves a most searching investigation. If deep chalk wells cannot be trusted, on what supply can we, with safety, place reliance?

Corporate water undertakings are not expected, and indeed ought not to be, particularly remunerative. The Leeds Corporation, with a capital expenditure of £1,274,029 on their water undertaking, and a rental amounting last year to £65,821, have only made a net profit of £2654. This is, perhaps, as it should be, but a further capital expenditure may be required, the interest on which may absorb more of the profits. But Leeds to-day grows apace, and when more prosperous times come, large additions are sure to be made to the demands on the Corporation for the water supply.

We learn that the Corporation of Nottingham have made an offer to the Water Company to take over the undertaking on the basis of perpetual annuities, at six and a quarter per cent. for the first year after the purchase, six and a half for the second, and seven for the third and all subsequent. These terms, we may take it, the Company will decline to accept. [Since the above was written, we have learned that the terms offered by the Corporation are still under consideration.]

The Manchester Corporation Water Bill, which is to authorize the Corporation to carry out the scheme of bringing a supply of water from Thirlmere Lake to Manchester and neighbourhood, passed the Commons Committee with very little opposition. A Mr. Ainsworth objected to the scheme on some grounds personal to himself and his interests, which the Committee attempted in vain to arrange. The opposition, it has been intimated, will be carried to the House of Lords, where we cannot expect a better fate to await it than it met with in the Commons. It is quite time that it should be strongly asserted that small private interests must not interfere with large public benefits. Mr. Ainsworth is, perhaps, under the circumstances, entitled to compensation, which he will, no doubt, receive, if his claim be substantiated. But it is unendurable that his personal interests should stand in tho way of a supply of wholesome water to the teeming population of Manchester and the surrounding district.

The Aldrington Water Company's Bill has, as we prophesied it would, failed. It was not of the character which we usually describe as "filibustering;" but, inasmuch as it proposed to seriously encroach upon the statutory rights of an established Company, it comes very near to that category. As it is, however, the Commons Committee, respecting what we may call vested interests, and being convinced that the resources of the Shoreham Company are ample for the effective supply of all their limits, declared the preamble of the Aldrington Bill not proved.

Death of Mr. J. Johnson.—We regret to have to announce the death, on the 29th ult., at his residence, 148, Goswell Road, of Mr. John Johnson, Chief Inspector of The Gaslight and Coke Company. It is almost impossible to estimate the great loss the Company will sustain by the removal of an officer holding the important position recently filled by Mr. Johnson, and one who discharged his duties with such unvarying efficiency as to ensure the entire confidence of his Directors; while his relations with consumers were such as to gain their utmost respect. It must be some consolation to his numerous private friends to learn that all those with whom he transacted business felt for him the very highest regard, and now deeply regret the severance of their connection with him. It can only be hoped that the reflection that this feeling generally prevails may, to some extent, mitigate the sorrow Mr. Johnson's family must feel at what may almost be regarded as the premature decease of one whose private and public character were alike unblemished. Mr. Johnson was in his 60th year.

Experiments in Improved Gas Lighting.—On Monday evening, the 24th ult., a series of experiments in artificial illumination by means of gas was inaugurated in the Central Exchange Art Gallery, Newcastle. In addition to a great variety of burners of ordinary sizes, a 50-candle, an 80-candle, and a 200-candle burner, recently invented by Mr. Sugg, were exhibited. The largest burner shown was that of Mr. Wigham, which gave a light equal to 400 candles. Prior to the exhibition of the lights, Mr. Barkas delivered a lecture on the history of artificial illumination. He remarked that the red rag of the electric light had been shaken in the faces of gas shareholders with temporary success, but that the economic and practical difficulties connected with electricity had not been surmounted, and it was an open question whether they ever would be. Mr. Edison had not overcome them, although he had heated 400 coils, and found his experiments a failure. The Avenue de l'Opéra, in Paris, Billingsgate Market, the Thames Embankment, the Holborn Viaduct, the British Museum Reading-Room, and many other places, had been lighted by means of electricity; but in nearly every case that system had been discontinued; while large 50, 80, and 200-candle power gas-lamps were now in use in the Waterloo Bridge Road, Waterloo Place, Regent Street, and Mansion House Street, London. It was not desirable, Mr. Barkas said, to have too large lights. There was a good attendance of visitors, and the experiments were highly successful.

Improved Public Lighting in Southampton.—Since the electric light has been prominently brought under public notice, those connected with gas have demonstrated that open spaces can be made more than light enough for traffic after the sun has set. To show the local public what gas can do, the Directors of the Southampton Gas Company recently gave instructions to erect in Marland Place and the London Road, as far as Cumberland Place, burners regulated to supply 6 cubic feet of gas per hour in lieu of those consuming 4 feet per hour, as in use in the borough. An order was also given to Mr. W. Sugg, of Westminster, to supply one of his 200-candle burners, with a suitable lantern, such as those recently fixed in London, and on Monday night, the 24th ult., the Mayor having assented to the alteration, it sent forth its brilliant rays on the open space from the large lamp-column at the top of Commercial Road, at its junction with the High Street. The burner is known as Sugg's quadruple Argand, consisting of four concentric rings made of steatite, connected by brass tubes, with a chamber underneath, containing the regulator, and passing gas to the point of ignition at the rate of 60 cubic feet per hour, giving forth a light nearly equal to 200 sperm standard candles, at a cost of 3d. per hour. A small flash-light with a separate regulator is kept burning all day, so that when the lamplighter goes his usual round he has simply to open the tap of the large burner, and instantly the store of gas is drawn upon, and the brilliant light bursts through the lantern, which is of large size, with plain glass underneath and white opal forming the top, and, acting as a reflector, throwing the rays of light without shadow all round. The 6-feet flat-flame burners, we may add, are placed in Skelton's catoptric lanterns, and, with the continuous rays of light along the footpaths, so greatly enhance the general effect, that it seems strange their superiority has not found for them a larger place in the public lighting arrangements. The new light has been fitted up under the superintendence of Mr. S. W. Durkin, the Engineer to the Gas Company, who bear the entire expense of the work.

THE LONDON WATER COMPANIES AND THEIR CRITICS.

The London Water Companies have no reason to dread a fair discussion of the facts connected with the Metropolitan Water Supply. But an assembly of Vestry delegates specially appointed to consider this question, is not a very likely arena for an impartial consideration of the subject. A meeting of delegates thus commissioned, was held in the St. Martin's Vestry Hall about a month ago, and this meeting was followed by another, held by adjournment on Thursday last. We have no desire to quarrel with these gentlemen, although, as the Vestries are represented at the Metropolitan Board, this gathering of delegates might be deemed somewhat extra-judicial. However, we are ready to hear what the delegates have to say, and we must expect that they will leave nothing unsaid which can strengthen their case. They conceive that they have a substantial grievance against the Water Companies, and that everybody else has more or less reason to complain likewise. Of course, nothing in this world is perfect, whether it be the management of the water supply or the administration of a parish. We believe it would be quite possible to call a meeting, at which various resolutions would be passed, complaining in a very doleful and remonstrant strain respecting the conduct of the Vestries and District Boards themselves. It might not be difficult to show that local taxation in the Metropolis had increased more rapidly than the benefits which were supposed to be received in return. It might be shown that a great and sweeping reform was necessary, and that the Vestries and District Boards ought to be speedily put out of the way, so as to make room for a more efficient and less expensive system of local government. Still, we admit that a good deal might be said on behalf of these Local Authorities, and perhaps the people most loud in condemning them are those who know least of what those bodies are doing. So also with regard to the Water Companies. The delegates may find, as they go further into the matter, that the London Water Companies are not without their redeeming qualities, and, though they have their defects, it will be a difficult matter so to supersede them as to provide a satisfactory substitute.

We do not know what the delegates may think, but it seems to us that they are very considerably overshadowed by their Chairman. About twenty-four Vestries are said to have been represented at the recent meeting, and it looks very much as if the representatives of the four-and-twenty Vestries had little else to do than to sit and hear what Mr. Edward J. Watherston had to say. This gentleman gave a kind of lecture on the Metropolitan Water Supply, and the admiring delegates passed a resolution expressing their agreement in what their Chairman said. Certainly this is a curious way of discussing the Water Question, but the monotony was somewhat relieved by a protest on the part of the delegates against the proposal that the Local Government Board should have a controlling power in respect to the Water Supply of London. It was Mr. Watherston's idea that, "in the absence of a Municipal Corporation, "or of any representative body willing and competent to "undertake the consolidation of the works," there should be a special Water Commission, responsible to the Local Government Board. The delegates seem to have accepted the idea of a Commission, but the supervision of the Local Government Board was held to be intolerable. The Chairman yielded, and it was then resolved that his speech—or lecture—should be printed and circulated. But the incident shows where the difficulty lies. If the Companies are to be got rid of, who is to take their place? The Metropolitan Board, as at present constituted, is not strong enough for the task. A Special Commission, if appointed, would derogate from the dignity and influence of the Board, and if the Government were allowed to interpose its authority, the Vestries, as well as the Board, would begin to quake for their independence. We have already warned the members of the Metropolitan Board that, by inconsiderately attacking the Water Companies, they may pull their own house about their ears. The formation of a Special Commission for the management of the water supply would be as decided a step as that which created the Metropolitan Board in order that London might be sewered. It would be setting up another sun in the Metropolitan firmament, and it would simply herald the extinction of the Board. The Vestry delegates were themselves a little nervous when the Local Government Board was mentioned. Anxious as these gentlemen may be for the abolition of the Water Companies, they are yet more anxious to preserve themselves from annihilation.

"The enormous increase in the rateable value of the Metro-"polis" is made the basis of a great amount of indignation directed against the Water Companies. If this increase were actually due to a rise in the rateable value of each house, there might be reason in the outcry. As it is, there is something ludicrous in the lamentation which is poured forth on this topic; there is also something exceedingly unfair in continually parading this rise in the rateable value of London, without any reference being made to the enormous increase in the water supply itself. The revenue of the Water Companies is, of course, based on the annual value of the houses, and there must necessarily be a basis of some kind. Even a Special Commission must have some rule to go by, other than the indefinite notions of propriety entertained by a Vestry or its delegates. Mr. Watherston quotes statistics to show that the rateable value of the Metropolis has received an immense addition during the last twenty years. We should expect that it had, seeing what has been the increase in the population and in the extent of ground covered with houses. We may as well take a glance at the other side of the medal which Mr. Watherston has held up. In 1867, according to the report of the Royal Commission on Water Supply, the number of houses supplied by the London Water Companies was 441,442, having 3,100,000 inhabitants, the average daily supply of water being 98,600,248 gallons. According to Colonel Bolton's report, in February last, the number of houses supplied has risen to 554,227, the population being 3,994,000, and the average daily supply (for February) 129,941,898 gallons. A great deal is being said about the growth of the capital account. In 1867 it was £8,769,514. The present amount verges on £12,000,000. But Mr. Watherston puts the case very differently. He argues that whereas the rateable value of the Metropolis was £11,283,663 in 1856, and £23,111,313 in 1876, "thus" it was that the "value of the Water Companies" rose from six millions in 1857, to twelve millions in 1865; "and now, last "year," he observes, "they had become worth, it is said, twenty-"five millions sterling." According to this gentleman's own showing, the capital expenditure of the Water Companies, deduced from the statement for 1875–76, was £11,413,756. If the Water Companies had mismanaged their affairs, and squandered their capital recklessly, perhaps their shares would be at a discount in the market. If they have behaved with prudence, we do not know that they ought to be blamed; and if their shares are at a premium, that may not be a sufficient reason why Mr. Watherston should wax indignant. During all these years, there has been a growing pressure on the London Water Companies to improve and extend their works. They have done so, and have necessarily expended capital in so doing. The outlay has been requisite, not only for the sake of improvement, but in order to keep pace with the population. London has become bigger, thereby causing an enlargement in the business of the Water Companies, and, at the same time, increasing the rateable value of the Metropolis in the aggregate as well as in detail.

Mr. Watherston's views being formally and explicity adopted by the delegates of the four-and-twenty Vestries represented at St. Martin's-in-the-Fields, we are warranted in citing what this gentleman says as the utterance of the Vestries themselves. Thus we are told that "the most serious matter for the consi-"deration of the ratepayers of the Metropolis and the consumers "of water is, not alone the increased and rapidly-increasing value "of the property of the several Water Companies, owing to the "principle upon which they are legally entitled to make their "charges, but also the reduction of a largely unremunerative "expenditure, and the prevention of its continued augmenta-"tion by outlays for unnecessary works." We have already dealt to some extent with the former part of this indictment, and we are now referring more immediately to the latter part. If Colonel Bolton were called as a witness, we apprehend that he would differ considerably from Mr. Watherston as to the alleged outlay for "unnecessary works." Colonel Bolton, as the Metropolitan Water Examiner to the Local Government Board, has regard to the quantity of water, its quality, and the manner of its supply. In his monthly reports, he never fails to point out what more is wanted with regard to the capacity of subsiding reservoirs and filter-beds. In the report issued a few days back, we find Colonel Bolton saying in reference to the Southwark and Vauxhall Company: "Subsiding reservoirs being absolutely necessary, "arrangements have been made for their construction on suit-"able ground near the intake at Hampton. Without such sub-"siding reservoirs, this Company cannot deliver water efficiently "filtered during the prevalence of floods." Again, we read: "The construction by the Grand Junction Company of addi-"tional impounding and subsiding reservoirs at the intake at "Hampton (which have been much needed to avoid taking "in water when floods prevail) is progressing." In respect to the same Company it is stated: "The existing filter-beds at "Kew will also be put in thorough working condition, and the "construction of an additional filter of nearly one acre in area is "being proceeded with, and is nearly finished." It is also recorded that "an additional line of main from the Kew works

"to Notting Hill is under construction." The New River Company are described as sinking a deep well at Turnford, and making several important additions to their distributory works, so as to separate the different levels of their service into convenient zones, at the same time adding to the power and means of communication by which their different stations are enabled to assist one another. The result of what has been already done is shown by the statement: "This Company are quite prepared to give "constant supply when called upon to do so by the public autho- "rities."

We might extend these quotations; but it is palpable that the rapid growth of the Metropolis, coupled with a higher standard of requirement as to the conditions of supply, must necessitate an addition to the capital expenditure of the Companies. There is a loud demand for a constant service, concerning which Colonel Bolton says that, with the exception of the Southwark and Vauxhall, and Grand Junction Companies, "all the Com- "panies are moving in the matter, and giving a constant supply "under the provisions of the Metropolis Water Act, 1871, in a "portion of their districts." If we turn to the annual report of Mr. Allan Stoneham, the Government Auditor, we find that gentleman saying: "It has been assumed that, whilst advantage "has been taken by the Companies of the accidentally enhanced "value of property to gather in enlarged profits, the statutory "requirements under which they lie to give constant supply "and well-filtered water have been to a great extent disregarded." The Auditor observes that it does not come within his promise to ascertain, "whether these allegations could be sustained;" but he goes on to say that "no instance" has come under his notice "in which the rates levied were not authorized by the "Acts governing the Companies." Whether these rating powers would not have been modified, had Parliament foreseen the extraordinary growth in value of Metropolitan property, is, however, a question which Mr. Stoneham thinks open to discussion. So far as the charge of spending large sums on "unnecessary works" is concerned, we see nothing to support it in the reports of either Colonel Bolton or Mr. Stoneham, and the latter may be said to imply that, whatever may be thought as to the basis of charge, the Companies do not demand more than the amount to which they are entitled by law. Indeed, it appears very distinctly that the Companies often take less than their due. Mr. Stoneham says, "It appears "to have been the practice of the Companies to regard the exer- "cise of the powers within the statutory limits as permissive." He believes inquiry would establish the fact "that, in some "districts, the rates authorized to be levied are fully enforced, "whilst in others no revision of the charges has been made for "many years." Mr. Stoneham expects it would be found in some parts of the Metropolis "that old tenants are supplied on "the original basis, whilst new tenants are charged on the basis "of the re-valued premises."

Whatever may be said as to the present state of things, it is not easy to devise a mode of charge which shall be free from objection. Some broad rule has to be laid down, and in particular cases it will appear to operate unfairly. It will be sound policy on the part of the Water Companies to give due weight to exceptional circumstances, and not in all cases to enforce their full claim. They have acted very largely on this principle in the past, and it will be prudent to adhere to it. If ever the supply passes into the hands of a Municipal Authority, the public will not find themselves quite so gently dealt with, and it may be as well for the consumers to see that such is the prospect. But there are other grievances advanced by Mr. Watherston. He considers it the fault of the Water Companies that London is not studded with hydrants, constantly supplied with water at high pressure, so as to provide for the prompt extinction of fires. How Mr. Watherston reconciles this view of the case with the adoption of the hydrant system by the City Commissioners of Sewers, we do not know. The Metropolitan Board also, startled by the recent conflagration on the premises of Earl Granville, next door to their head-quarters in Spring Gardens, have resolved to protect their own premises by means of hydrants. The only obstruction to the introduction of the hydrant system in London, is to be found in the policy which has been pursued by the Metropolitan Board. If the Board were either to exercise their own powers, or to co-operate with the Water Companies, London might be as secure against fire as Manchester itself.

There are higher authorities than the Vestries. There is Parliament, and there is the Government. On behalf of the latter, the Home Secretary "does not wish to retract anything he said "last session" in respect both to the gas and the water supply, neither can he promise "immediate legislation," though "the "subject has not been lost sight of." Mr. Fawcett is going to call attention "to the deficiency both in the quality and the "mode of supply of water to the Metropolis, and to the serious "burdens imposed on the people of London by the increased "charges of the Water Companies;" following this up by a motion that, as the Metropolitan Board have not been able to pass a measure dealing with the water supply, the Government should proceed to take it in hand without delay. In the face of this proposition we would suggest that, if the sewage is kept out of the Thames above the intakes, and the Water Companies make proper arrangements with regard to reservoirs and filter-beds, there will be no valid ground of complaint as to quality; neither can it be proved that the water is otherwise than wholesome at the present time. As to the "mode of supply," if the allusion is intended to cover a demand for the constant service, we would refer Mr. Fawcett to Colonel Bolton's last Annual Report, by which it appears that whereas there were 75,106 houses in the Metropolis receiving a constant supply in 1876, the number in 1877 was 102,794, thus exhibiting an increase of 27,688. The report for the month of February last shows the number of houses supplied on this system to be 125,326. In respect to the quantity of water available for individual consumption, irrespective of any question as to the constant service, we may be reminded of the complaints emanating from Bermondsey last year, and from the East London district at a more recent date. But the defects which gave rise to these complaints are clearly capable of remedy, without invoking a grand legislative operation. The lack of pressure in the East London district is being set to rights, by dividing the area into zones, and we hope the Southwark Company will be able to deal satisfactorily with the Bermondsey question. Concerning the water supply of the Metropolis in its entirety, the latest official report shows the daily average to be rather more than thirty-two gallons per head, of which twenty-six gallons would be available for domestic purposes. This is the usual rate, taking the year all through, and it cannot be said that the supply is a scanty one.

What the Government can do to satisfy Mr. Fawcett is by no means clear, and we do not expect that the honourable member will make the matter much clearer than it is. By a curious coincidence, the notice given by Mr. Fawcett, in the House on Friday, concerning the Water Companies, was accompanied by one from Mr. Baillie Cochrane respecting the Vestries. The latter gentleman is going to call attention "to the great increase "in the local taxation of the Metropolis, while the Vestries fail "to carry out any sufficient sanitary arrangements." A Select Committee is to be moved for, to inquire into the doings of the Vestries, and perhaps such an inquiry might not be amiss. While these Local Authorities, therefore, are proposing to reform or supersede the Water Companies, they are in some danger of being treated in like manner themselves. The zeal with which the Vestries enter into the gas and water questions is rather amusing, when we consider what some people say about these bodies. The conduct of one Vestry has even scandalized the Metropolitan Board, and that to such an extent that the Board will have nothing to do with the said Vestry until it has passed through the purging fires of a fresh parochial election. Of the Metropolitan Board and the Vestries it may, perhaps, some day be said, that, having suffered persecution, they have learned mercy. The Local Authorities will have their time of tribulation as well as the Water Companies, and possibly the latter have less to fear than the former. So far as present indications are concerned, the Local Authorities might be glad if their sky were as clear as that of the Companies whom they have so persistently endeavoured to bring into disrepute.

INSTITUTION OF CIVIL ENGINEERS.—The Council of this Society have arranged a second series of supplemental meetings, for the reading and discussion of papers by students, to take place on the following Friday evenings:—March 28.—"An Account of some of the East London Water-Works Company's Extensions." By G. L. Parrott, Stud. Inst. C.E.; April 4.—"The Tidal Wave in the River Humber." By A. C. Hurtzig, Stud. Inst. C.E.; April 18.—"The Construction of Locomotive Boilers." By R. H. Read, Stud. Inst. C.E.; April 25.—"The Comparative Merits of the different Systems of Permanent Way." By Richard M. Parkinson, Stud. Inst. C.E.; May 2.—"Gas Purification." By T. N. Kirkham, Junr., Stud. Inst. C.E. The chair will be taken at seven o'clock on each evening, and successively by Mr. Rawlinson, C.B., Mr. Abernethy, Mr. Berkley, Mr. Brunlees, and Dr. Pole, Members of Council.

SUBTERRANEAN WATER AT CHARING CROSS.—In the rebuilding, at the corner of Spring Gardens, of Messrs. Drummond's Bank, by Messrs. Waller and Son, contractors, of Belgrave Square, the foundations had to be carried, owing to the nature of the ground, to a depth below the road level of 30 feet, and so large a quantity of water was met with that steam pumping became necessary. The pump discharges into the right-hand tank at the rate of about 8000 gallons of water per hour, and so heavily charged with sand was this water, whilst the excavations were proceeding, that this tank was rapidly filled with sand, which had to be constantly removed in buckets. As a supply of clear water for all purposes was required, the left-hand tank was arranged to receive the clear water from the first tank by a pipe connecting the two tanks at the top, that which is not required running away by an overflow-pipe. The clear water thus obtained suffices for all the operations in the building, so that there is no need of any supply from the main.—*Builder*.

A TREATISE ON THE SCIENCE AND PRACTICE OF THE MANUFACTURE AND DISTRIBUTION OF COAL GAS.

CLXXIV.

NITROBENZENE.

This substance has been already alluded to in Vol. xxviii., p. 79. It was there stated that the presence of a very small amount of benzole in coal gas could be detected by passing the gas through fuming nitric acid; it was thus converted into nitrobenzole, which could be recognized by its odour—that of oil of bitter almonds. Nitrobenzene is also known as nitrobenzol, nitrobenzole, nitrobenzid, nitrobenzine, and oil or essence of mirbane. In commerce, the ordinary product used for conversion into aniline is almost universally called nitrobenzole. Its chemical formula is $C_6H_5NO_2$. It is a yellow liquid, having a sweetish taste, and, as we have said, a smell of oil of bitter almonds. Unless the benzene from which it has been prepared is very pure, the bitter-almond-like smell is accompanied by a very disgusting odour, which may be perceived on rubbing a little between the hands. This is particularly the case if the hydrocarbon from which it was prepared contained olefines.

The name of essence or oil of mirbane is applied to a product obtained from very pure benzene, and afterwards distilled in a current of steam. By this means it becomes a pale yellow liquid, having a fragrant odour, and free from the after-smell to which we have alluded.

The specific gravity of nitrobenzene is 1·1866 at 14·4° C. = 58° Fahr. Cooled to 3° C. = 37·4° Fahr., it crystallizes in needles. It is formed by the action of nitric acid upon benzene in accordance with the formula—

$$C_6H_6 + NO^3H = C_6H_5NO_2 + H_2O.$$

And it is, therefore, benzene in which one atom of hydrogen is replaced by nitric peroxide or nitryl.

There are a great number of methods of preparing nitrobenzene. The operation is always unwholesome to the workmen who breathe it, or get it on their clothes or hands. The first signs of poisoning by it are blueness of the lips, and a peculiar leaden greyness of the eyeball. The moment this is seen, the workman should be made to cleanse himself thoroughly, if possible, in a warm bath; and, if any convulsive movement appear, he should at once have medical attention. Fatal accidents have occurred from men entering stills or storing vessels which contained the vapour of nitrobenzene.

In addition to its poisonous qualities, its preparation is a somewhat dangerous operation, owing to the fact that the reaction between nitric acid and benzole is one of peculiar uncertainty. Unless a definite amount of heat is generated, the reaction is imperfect, and, if it rises beyond a certain point, dangerous explosions are liable to occur. With practice, however, a skilful workman can generally acquire such a complete mastery over the operation as to render accidents very rare. It is necessary, nevertheless, to take every precaution, and especially to conduct the manufacture in a building apart from the others.

There are only two processes which need be mentioned, as being typical of the rest—namely, those of Messrs. Nicholson and Maule, and Messrs. Perkin.

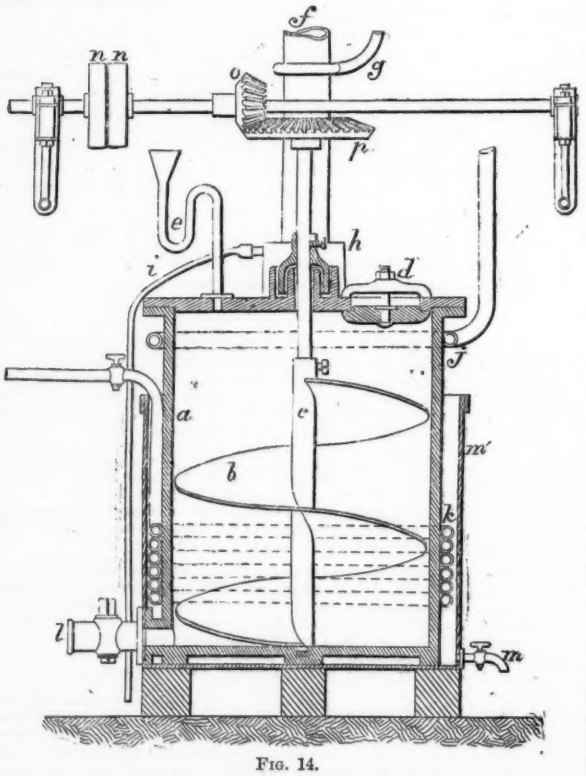

FIG. 14.

The apparatus of Messrs. Nicholson and Maule, shown above, contains every requisite for controlling the operation, and is the most perfect with which the writer is acquainted, although he has tried a great variety of contrivances for the purpose. It is thus described in the work of MM. Girard and De Laire. A cast-iron cylinder, *a*, is fitted with a vertical spiral agitator, *b*, attached to the shaft, *c*. This being an expensive part of the apparatus, the writer substitutes for it cast-iron blades, placed at an angle, and attached by pinching screws. By this arrangement, a blade, when worn out, can always be replaced at a small expense. The man-hole, *d*, is stated by MM. Girard and De Laire to be for the purpose of introducing solid materials. The writer, however, has never had occasion to use solid materials in this method of working. It is only in Perkin's process with nitrate of soda and sulphuric acid, to be described presently, that, so far as he is aware, solid materials are ever used in the manufacture of nitrobenzole. The siphon, *e*, serves for the introduction of the benzole, which is all run in at once, and, afterwards, for the mixture of nitric and sulphuric acids. The vapours which form during the process escape by the tube *f*; but, as they might carry away benzole, especially when the mixture in the interior becomes warm, a spiral tube, *g*, enables a current of cold water to be run over it, and thus prevents loss. A cylinder of water, *h*, surrounds a water-trap, one part of which is attached to the shaft, *c*, by a pinching screw, shown in the engraving. The surplus water runs away by the tube, *i*. In order to enable the cylinder, *a*, to be cooled when necessary, a spiral tube, *j*, is so arranged that a stream of cold water may be made to run over its surface; on the other hand, the cylinder can be warmed, when necessary to set up the reaction, by the spiral steam-pipe, *k*. The dilute acid and the nitrobenzene can be removed at the end of the operation by means of the tap, *l*. The jacket, *m'*, can be emptied by means of the tap, *m*. Motion can be communicated to the shaft, *c*, by the fast and loose pulleys, *n n*, which set in motion the bevel wheels, *o* and *p*.

If the nitration of the benzole has been incomplete, which can be ascertained by its having too low a specific gravity, the benzole must be removed by distillation in a current of steam, the operation being stopped when the distillate sinks in water.

Before conversion into aniline, the nitrobenzole must be washed. Owing to the difference in their densities, the acid can be separated from the oil by means of the tap, *l*. Some lime and water are then to be introduced by the bent tube, *e*, and the mixture is to be stirred for, say, a quarter of an hour or twenty minutes. The tap, *l*, is then to be opened partially, so as to allow as much of the liquid to run out as will effectually wash out any adhering acid from the tap. The fluid is then to be tested by means of litmus paper, and, if very acid, more lime is to be added. This process is to be repeated until the liquid is nearly or quite neutral. An excess of lime is to be avoided, as it increases the difficulty of separation. The whole is now allowed to rest until separation has taken place. The nitrobenzole may then be washed once or twice with water.

If the necessary time for the washing in the nitrating cylinder cannot be spared, in consequence of the apparatus being required for a fresh charge, the operation can be conducted in a separate vessel.

Even when the nitrobenzole and water have been allowed to stand some time, there is almost always a portion which comes away in a frothy or creamy condition. This may be stored in a vertical cylinder, to allow of longer repose. By having two or three taps at different heights, the oil can be removed as it separates, and, as it is removed, more of the creamy mixture can be added. Two such cylinders of 100 gallons capacity will be sufficient for a large production of nitrobenzole.

If any portion of the creamy mixture of nitrobenzole and water obstinately refuses to separate, it may be distilled in a current of steam as long as any oil comes over. This oil, if sufficiently fragrant, may be put aside as oil of mirbane. Theoretically, 100 parts of benzene should give 157 of nitrobenzole; in practice, however, this is never obtained. MM. Girard and De Laire consider that 135-140 for 100 of benzene is an average result; but much depends upon the quality of the benzole, the temperature of the atmosphere, and the skill with which the operation has been carried out.

Communicated Article.

GAS AS FUEL.

III.

By "ISCA."

If the numbers expressing heat-units become cumbrous, as would probably be the case in dealing with any considerable weight of fuel, they may be reduced by dividing by 966, which would give the weight of water at 212° evaporated into steam at 212°; or, by dividing by 1146, which would give the weight of water at 32°, raised to boiling point and evaporated. Thus, a pound of coal would raise 12·46 lbs. of ice-cold water into steam, while a pound of rectified petroleum would so evaporate 24·13 lbs. of water, and a pound of coal gas would evaporate 19·06 lbs. Otherwise expressed, to raise a gallon of water at freezing point to steam, at atmospheric pressure, would require 0·80 lbs of coal, and 0·41 lbs. of petroleum, or 8·52 lbs. of coal gas. Or the (apparent) loss of heat due to the proportion which becomes what is called latent, when steam is produced, may be avoided, and in this form we may express the heating effect of a pound of coal to be equal to raising 79·38 lbs. of water from freezing to boiling point, while an equal weight of mineral oil would boil 153·4 lbs. of water, and a pound of coal gas (which would, with a specific gravity of 0·426 under standard pressure and temperature, occupy 32 cubic feet) would boil 121·39 lbs. of ice-cold water.

But we have seen that the useful effect of coal is reduced by loss of heat by means of ashes, and the difficulty of ensuring its complete combustion into carbonic acid, so that not more than about 60 per

cent. thereof is actually available, even in favourable cases; thus diminishing the weight of water which would be actually boiled to about 48 lbs., whereas the loss in the cases of oils and gas may be considered very trifling, and, in fact, may be almost ignored, especially in the case of gas. Making, however, a slight allowance, it may be stated that the weights of freezing water which could be boiled by a pound of each of these three fuels would be—coal, 48 lbs.; coal gas, 120 lbs.; mineral oils, 150 lbs. It must be remembered that each fuel is supposed to be exerting its full average energy under conditions similarly favourable all round.

Under such circumstances, and taking the average cost of the materials in London, the cost of boiling, by one operation, 1000 gallons of water at 32° would be—with coal, 1s. 10½d.; gas, 9s. 4d.; mineral oils, 12s. 6d. But these figures are susceptible of much modification when, instead of assuming equally favourable conditions for each kind of fuel, the actual circumstances are taken into consideration. The majority of gas, coal, and oil users do not require to boil such a large quantity of water, and the same prices would not hold good proportionately for fractional weights. Only for oil and gas could such a result be divided with anything like an approach to accuracy, because it is only in the cases of liquid or gaseous fuel that large and small volumes can be burnt with equal facility.

Not that there is no advantage in the combustion of such fuels in large volumes, for it must be evident that, under such conditions, it is possible to utilize some of the heat lost by radiation in warming the air surrounding the flame; but this advantage is not sufficiently valuable to prejudice the truth of the practically infinite divisibility of fuels of these descriptions, as compared with coal. For instance, although 208 lbs. of coal would boil 1000 gallons of water, it would be practically impossible so to utilize the energy of 2·08 lbs. of the same coal as to boil a gallon of water with it. The comparative sluggishness of its action with oxygen necessitates a certain bulk of the fuel being kept in a state of incandescence, in order that the carbon and hydrogen may be consumed with sufficient rapidity to afford any useful effect. As a matter of fact, it has been found that about thrice the weight of coal above stated would be required, even when a fire is made up for the purpose of testing its performance, and it is not too much to assume that, under ordinary conditions, household fires are kept at least twice as large as in the case of an experiment, in order to avoid the risk of burning low, and to save the trouble of continual feeding. We are, therefore, led to the conclusion that, with slight exceptions, barely one-seventh part of the vast amount of coal which is burnt in the United Kingdom for culinary and other household purposes is really utilized, the remainder being absolutely wasted.

These reflections are based, it is scarcely necessary to state, on considerations of work only; the question of warming apartments, &c., not entering for the present into the scope of these inquiries.

Returning to the question of the cost of boiling water, which we have taken as our standard of effect, and bearing the above-mentioned observations in mind, we shall find that the ordinary cost of boiling 1000 gallons of water, in small quantities and at various times, would be about as follows:—With coal, 13s.; mineral oil, 12s. 6d.; gas, 9s. 4d.; and if to the cost of coal is added that of kindling wood, &c., and the waste which goes on by means of the fire having to be kept up when doing no actual work, in order that it may be ready when required, the disparity is yet greater.

The conclusion to which we are led in the foregoing paragraph is somewhat curious. It could scarcely have been expected that it would be more economical to burn gas than coal, seeing that the one is manufactured from the other, and is sold at a price which has to cover the cost of manufacture and distribution, in addition to the prime cost of the raw material. The advantage to the consumer is to be found solely in the difference in degree of adaptability of the two forms of matter—in the greater facility with which the energy of gas can be made available as and when required.

The competition between gas and mineral oil as fuel is remarkably close. Nothing could detract from the advantages derivable from the portability of petroleum, save the danger attending it when heated, which must always be the case when the reservoir of oil is in such proximity to the point of combustion as is essential to the due development of the heating effect. It is impossible to contemplate the progressive increase in the construction of oil-stoves for every household purpose, and the portentous dimensions to which some already attain, without reflecting on the danger caused by the exposure of such a highly inflammable material as mineral oil in reservoirs—often of slight construction—to the certainty of a considerable and perhaps unknown increase of temperature, and, from the very purposes which these utensils are designed to serve, generally in ignorant and unskilful hands. It is, of course, maintained by the manufacturers of these articles that, with a suitable oil, there is no danger attending their use; but when a stove of such a description is once adopted in a household, and the carelessness which familiarity brings supervenes, the suitable oil being exhausted, anything which smells like it is put in, and the result is not difficult to foresee.

Digressing for a moment from the main purpose of this article, it is easy to comprehend that the calorific power of mineral oils is anything but an advantage when they are used as illuminants. From the high place which they hold as fuel, it is evident that their use for lighting purposes must be attended with an excess of the heat which is sometimes complained of in gas.

Turning, in conclusion, to the dynamical effects of the combustion of gas, we shall find some curious facts. The energy required to raise a pound of water one degree of Fahrenheit's thermometer, is capable of raising a weight of 772 lbs. to a height of one foot, or 1 lb. to a height of 772 feet. By the table previously given (*ante*, p. 399) we find 100 cubic feet of gas will exert a force of 69705·647 units, or, in other words, is able to raise a weight of 24,023 tons one foot high, or lift one of the gigantic 81-ton guns from the Woolwich Arsenal to a height of nearly 300 feet. Supposing this energy could be developed in one minute, its equivalent in horse power would be 1630. An ordinary gas-burner, consuming 5 cubic feet per hour, exerts in that time energy sufficient to lift 1201 tons a foot high, or more force than would be necessary to raise a man of 13 stone to the summit of Mont Blanc. Every minute during which such a burner is alight it is doing work equal to 1·35 steam-horses. Supposing, for example, that the consumption of gas in London is 100,000 cubic feet during any minute, the force which such a quantity represents is equal to raising a weight of 718·6 lbs. to a height equal to the distance which separates the earth from the sun; or the power of 2,112,292 horses is required to light this Metropolis for a single minute of a winter's night.

Correspondence.

[*We do not hold ourselves responsible for the opinions expressed by Correspondents.*]

THE PRESENT POSITION OF THE ELECTRIC LIGHT QUESTION IN PARLIAMENT.

Sir,—As no further proceedings can now be taken in this matter before the Easter recess, I will, with your permission, explain what has been done up to the present time, and how the matter now stands.

The first formal proceeding in the House of Commons was on the 11th of March, and the Votes of the House for that day contain the following Order:—

"Liverpool Lighting Bill (by Order),—read a second time, and committed to a Select Committee of seven members, four to be appointed by the House, and three by the Committee of Selection.

"Instruction to the Committee that they have power to inquire whether it is desirable to authorize any schemes for lighting by electricity or other improved methods; to consider how far and under what conditions, if at all, the use of such modes of lighting should be sanctioned by Parliament in the case of Municipal Corporations, other local authorities, or public companies, and to report their opinion to the House; and that such of the petitioners against the Bill as pray to be heard by themselves, their Counsel, or Agents, be heard upon their petitions (if presented on or before the 17th day of March), and Counsel heard in favour of the Bill against such petitions: Power to send for persons, papers, and records: Four to be the quorum.—(The Chairman of Ways and Means.)"

The Committee subsequently appointed under this order were—

Lord Lindsay Mr. Adam Sir Ughtred Kay-Shuttleworth Mr. Spencer Stanhope	By the House.
Mr. Thomas Bruce Mr. Lyon Playfair Mr. Christopher Talbot	By the Committee of Selection.

This Committee met on the 20th to choose a Chairman and consider course of proceeding, when Mr. Lyon Playfair was chosen Chairman, and proceedings were adjourned till the 31st of March.

As this mode of proceeding was intended to have been an inquiry, in the usual way, before a Select Committee, with Counsel, Agents, &c., the Liverpool Corporation became alarmed at the very serious expense it might involve them in, and sent a deputation up to town respecting it. This deputation had an interview with the authorities of the House, and shortly after another order was made in the terms following:—

"Liverpool Lighting Bill.—Ordered, 'That the Order (11th of March) that the Liverpool Lighting Bill be committed to a Select Committee of seven members, four to be appointed by the House, and three by the Committee of Selection, be read and discharged.'"

Since then the notice for the meeting of the Committee on the 31st of March has been withdrawn, from which it is obvious that all intention of dealing with this matter in any of the Private Bills is abandoned, and that no such powers will be given either to Local Authorities or Gas or other Companies in the present session.

On the 28th of March, the House, at the instance of the President of the Board of Trade, passed another order, as follows:—

"Lighting by Electricity.—Select Committee appointed to consider whether it is desirable to authorize Municipal Corporations or other Local Authorities to adopt any schemes for lighting by electricity, and to consider how far, and under what conditions, if at all, Gas or other Public Companies should be authorized to supply light by electricity."

This, it will be observed, makes the inquiry independent of any private Bills, and places the matter on an entirely different and more satisfactory footing.

It is not quite clear, from the wording of this order, what is intended about the Committee itself. Probably the intention is to re-appoint the same members as a public Committee, by the whole House, in the usual way; but the inquiry referred to the Committee is very clear and distinct; and if, after an inquiry like this, the Committee report that it is desirable that gas companies should be authorized to supply light by electricity, it is quite certain that such authority will be given by means of a public measure applicable to all companies alike, not by means of the company's special Acts.

In the early part of the session the second reading of all the Gas Bill containing powers for lighting by electricity was put off from time to time, to abide the result of the inquiry ordered on the Liverpool Lighting Bill; but many of the companies, foreseeing that this would unavoidably cause very great delay in their proceedings, decided to withdraw those powers, and proceed with their Bills without them; and now, out of about 28 originally deposited, containing such powers, there are only nine or ten in which they are still retained. As these stand

for second reading next week, it is obvious that all such powers will then have to be withdrawn from those as well as the others. While the House has referred for consideration, as to whether it is desirable to grant such powers to gas companies or not, to a public Committee, and that Committee is sitting, the House cannot refer any private Bill with such powers to the consideration of another Committee, and any Company seeking to retain those powers, will incur a very great risk of losing their Bill altogether.

The mode of proceeding, in a public Committee, is for the Committee to hear all persons who are substantially interested in the matter referred to them, and desire to give evidence upon it, either for or against, as the case may be, and to have the power to order the attendance of any other persons whom they may think can give any information they require; and, as those Committees do not sit day by day, but only once or, at most, twice a week, they generally occupy the greater part of a session.

There are no questions as to time and *locus standi* in such cases. Persons desirous of being heard before the Committee have to write to the Clerk, stating generally what they wish to be heard upon, and how they are interested in the matter. The Clerk submits this letter to the Chairman, and then a reply is sent, naming a day on which the parties are to attend. Any Company desirous of explaining their own views will be at liberty to attend.

When the Committee have decided as to the days of meeting and course of proceeding, a circular will be sent to all the Companies, to inform them thereof.

I did intend to offer a few observations as to the expediency of granting parliamentary powers for these purposes to any one; but I find that to deal with the subject properly requires more time than I have at my disposal now, and therefore I must defer it till next week.

W. Livesey, Secretary.

Gas and Water Companies Association, 6, Victoria Street, Westminster Abbey, S.W., March 29, 1879.

THE SALE OF COKE BY MEASURE.

Sir,—The new Act for the regulation of Weights and Measures has caused some trouble to gas companies, and brought to the surface many divergent opinions as to whether coke should be sold by weight or measure. In the provinces, it has been usual to sell by weight, whilst in the Metropolis the custom of selling by measure has generally prevailed.

The question arose, how best to conform with the Act of Parliament and at the same time give the least offence to existing prejudices. Many were of opinion that to sell by weight was the least objectionable; but then buyers objected, because *coke is a great absorbent*, and nearly 20 per cent. of moisture may be added, without materially affecting the appearance of the article. Others, who favoured the sale by measure, found a difficulty in strictly adhering to the Act without doing their customers a serious wrong.

It had been the custom to sell by the chaldron of 36 heaped bushels. It was found that four strike bushels and three heaped bushels are very nearly the same. Therefore The Gaslight and Coke Company resolved to sell by the bushel, and to have the sacks of a uniform size, holding four bushels, and the following scale has been adopted at all their stations:—

Table for Calculating the Price of Coke when Sold by Measure.

Price per Bushel.	Per Sack of Four Bushels	Three Sacks, 12 Bushels.	Six Sacks, 24 Bushels.	Nine Sacks, 36 Bushels.	Twelve Sacks, 48 Bushels.
0s. 1d.	0s. 4d.	1s. 0d.	2s. 0d.	3s. 0d.	4s. 0d.
0 1½	0 4½	1 11½	2 3	3 4½	4 6
0 1¾	0 5	1 3	2 6	3 9	5 0
0 1⅞	0 5½	1 4½	2 9	4 1½	5 6
0 1¾	0 6	1 6	3 0	4 6	6 0
0 1⅞	0 6½	1 7½	3 3	4 10½	6 6
0 1⅞	0 7	1 9	3 6	5 3	7 0
0 1⅞	0 7½	1 10½	3 9	5 7½	7 6
0 2	0 8	2 0	4 0	6 0	8 0

By adopting the bushel as the unit, and the sack of four bushels capacity, all other points follow in admirable sequence. Those who desire to adhere to the strictly legal mode of dealing, and sell by the chaldron of 36 strike bushels, will be supplied with nine sacks, whilst those who prefer the old fashion can have their 12 sacks; and general dealers prefer this.

Much confusion has always existed among the London Gas Companies by reason of differences in measure. Now, if all the Metropolitan Companies will adopt this system, and make it uniform, and let the price per bushel determine the sale, much annoyance and many disputes will be obviated.

I have, in the foregoing table, adopted the eighth of a penny as the smallest advance; but, as this gives an advance of 6d. in the 12 sacks, or 48 bushels, and it may be necessary to quote a 3d. advance in such case, the seller must quote the 16th of a penny per bushel, and that will give 3d. on the 48 bushels. Although it looks so simple, it took a considerable time to work out and settle the problem.

I have not the least doubt that the plan adopted by The Gaslight and Coke Company will become general.

B.

March 28, 1879.

THE INITIAL PRICE OF GAS AT SOUTH SHIELDS.

Sir,—Permit me to correct an error which occurs in your "Circular" of the 25th inst., having reference to the compromise which has been effected between the Corporations of South Shields and Jarrow and this Company.

You say: "But the sliding scale is not to come into operation until an initial price of 3s. per thousand is reached." On reference to the report of the special meeting of the South Shields Town Council, which you kindly give on page 443, you will find that this was only a *proposal* from the Parliamentary Committees of the South Shields and Jarrow Councils to this Company. The proposal was *rejected* by the Directors of this Company, and, after considerable discussion, it was agreed that "the standard price shall be 3s. 3d.;" the sliding scale to operate as soon as the price rises above or falls below 3s. 3d.

Will you kindly allow this correction to appear in next number of the Journal?

J. H. Penney, Secretary.

South Shields, March 28, 1879.

THE RATING OF GAS-WORKS.

Sir,—Can you or any of your readers inform me upon what basis gas-works are rated?

In this town, the Assessment Committee are continually advancing the rates, and only last week I had to appeal, on behalf of the Gas Company, against this advance. The Assessment Committee informed me that the works were rated according to the amount of profit made. I replied, that if the works were let I did not think any person would be found to pay more than 5 per cent. on the capital, which is £3000 paid up and £200 borrowed, and I argued that to rate us at £160 gross and £136 rateable value would be about right. We are, however, rated at £200 gross and £170 rateable value, as the profits were £205 last year.

If any Secretary or Manager will be good enough to communicate with me by post before Friday next, the 4th of April, I shall consider it a great favour, as the matter comes up for discussion on Friday evening, at the meeting of my Directors.

S. Rutter.

Gas-Works, Brampton, Cumberland, March 29, 1879.

Parliamentary Intelligence.

HOUSE OF LORDS.

Monday, March 24.

The Dun Drainage Bill was committed.

Tuesday, March 25.

The Grand Junction Water Bill was brought from the Commons, read the first time, and referred to the Examiners.

Thursday, March 27.

Colwyn Bay and Pwllycrochon Estate Bill.—The Select Committee reported that they had not proceeded with the consideration of the Bill, the opposition thereto having been withdrawn.

A petition in favour of the Rathfarnham and Terenure Township Bill was presented from Ratepayers, &c., of Rathfarnham and Terenure.

Friday, March 28.

The West Kent Main Sewerage Bill was reported, with amendments.

The Bury St. Edmund's Gas, New River Company, and Nottingham Water Bills were brought from the Commons, read the first time, and referred to the Examiners.

Llandudno Improvement Bill,—read the third time, amendments made, Bill passed, and sent to the Commons.

HOUSE OF COMMONS.

Monday, March 24.

The Examiners reported that Standing Order No. 62 had been complied with in the case of the Newcastle-upon-Tyne and Gateshead Gas Bill.

The Grand Junction Water Bill was read the third time, and passed.

Bills, as amended, considered, and ordered for third reading:—Bury St. Edmund's Gas, New River Company, Nottingham Water.

Bills read a second time, and committed:—Bromley Gas, Mirfield Gas, Wombwell Local Board.

Bills reported:—Glossop Gas, Dearne Valley Water (parties do not proceed).

A petition in favour of the Birmingham Gas Bill was presented from (1) Owners, &c., and consumers of gas and inhabitants of Northfield, (2) Ditto of Yardley.

LIVERPOOL LIGHTING BILL.

The Chairman of Ways and Means moved—"That the order (11th of March) that the Liverpool Lighting Bill be committed to a Select Committee of seven members, four to be appointed by the House, and three by the Committee of Selection, be read and discharged." In explanation of this proposal, he stated that the parties who had promoted the Bill declined to proceed with it, on the ground that they did not feel justified in solely incurring the heavy expense which would be involved in the inquiry contemplated by the House into the whole question of the adoption of the electric and similar systems of lighting. In the meantime, the other Bills in which powers to adopt the electric light were applied for, would be suspended.

The resolution was agreed to.

Tuesday, March 25.

The Manchester Corporation Water Bill was reported.

Thursday, March 27.

Bills read the third time, and passed:—Bury St. Edmund's Gas, New River Company, Nottingham Water.

Bill reported:—Brighton and Hove Gas.

The *locus standi* of the Guardians of the Poor of the Cardiff Union and others against the Cardiff Corporation Bill was disallowed (except as against clause 7).

Friday, March 28.

The Tipton Local Board Bill, as amended, considered; to be read the third time.

Bills reported:—Birmingham Gas, Rawmarsh Local Board, Rotherham Borough.

Requisitions to withdraw their petitions against the following Bills were presented:—Bromley Gas, from the Postmaster-General; Warrington Corporation, from the Duke of Bridgewater's Trustees and the Earl of Ellesmere's Trustees.

WATER SUPPLY IN THE METROPOLIS.

Mr. Fawcett gave notice that, on an early day after Easter, he would call attention to the deficiency both in the quality and mode of supply of water to the Metropolis, and the serious burdens imposed on the people of London by the increased charges of the Water Companies, and move the following resolution:—"That in view of the fact that the Metropolitan Board of Works has been unable to pass any measure dealing with the water supply of London, this House is of opinion that it is a subject which ought without delay to be taken in hand by Her Majesty's Government."

THE SUPPLY OF THE ELECTRIC LIGHT.

On the motion of Viscount Sandon a Select Committee was appointed "to consider whether it is desirable to authorize Municipal Corporations

or other Local Authorities, to adopt any schemes for lighting by electricity, and to consider how far, and under what conditions, if at all, Gas or other Public Companies should be authorized to supply light by electricity."

LOCAL TAXATION IN THE METROPOLIS.

Mr. BAILIE COCHRANE gave notice that on Friday, April 25, he would "call the attention of the House to the great increase of the local taxation of the Metropolis, while the Vestries fail to carry out any sufficient sanitary arrangements, and to move for a Select Committee to inquire into the powers of the Vestries, and their administration of the funds at their disposal."

HOUSE OF COMMONS COMMITTEE.

TUESDAY, MARCH 18.

(*Before Mr.* ASSHETON, *Chairman; Mr.* A. H. BROWN, *Lord* C. BRUCE, *and Colonel* DRUMMOND-MORAY; *Sir* JOHN DUCKWORTH, *Referee.*)

ALDRINGTON WATER BILL.

Mr. BAZALGETTE appeared for the promoters, who are the owners of the Aldrington Estate; Mr. O'HARA appeared for the Shoreham and District Water Company, who opposed the Bill.

Mr. BAZALGETTE, in opening the case for the promoters, said the Bill sought to incorporate the Aldrington Estate Water Company, with power to supply water to that estate, which was situate to the west of Brighton, and contained some 600 acres, all of which, with the exception of 17 acres, was in the parish of Aldrington, the 17 acres being in the adjoining parish of Portslade. In order to show the necessity for this Bill, he ought to point out to the Committee the history of the development of this estate. Some few years back the ground was purely agricultural, but as the town of Brighton developed, it became manifest that Aldrington was the natural outlet, and in 1877 the estate was purchased by the present owners as a building estate. It had been laid out for that purpose, and would shortly be built upon. All the necessary preliminaries had been taken, roads had been made, sewers had been built, and groynes constructed to prevent the encroachment of the sea. The building plans, he believed, contemplated the erection of ten houses to the acre, which would, in round figures, give a total of 6000 houses to be built upon the estate. Taking a population of six persons to each house, the Committee would see that there would probably be a population amounting to 36,000 to be supplied with water. Naturally the question of water supply was one of the first considerations in developing an estate like this, and the promoters of the Bill—who were the owners of the estate—were brought face to face with this question at a very early period. In the course of last year they let out a large portion of the estate for the purpose of brickmaking, and a good supply of water was necessary for carrying on that business. As they could not obtain water elsewhere, they were obliged to sink a well 80 feet deep upon the estate, in order to procure a supply, and since that they had laid down mains to carry the water to the different parts of the estate, where they were under covenants with various builders to supply it. Some two miles of mains had been laid down, at a cost of between £4000 and £5000. In order, however, to show the necessity for the Bill, he ought to prove to the Committee that the promoters could not obtain a supply of water from the existing works either at Shoreham or at Brighton. The Shoreham Water Company were established in 1868, under the Companies Act of 1862, and the parish of Aldrington was not at that time included within the limits of supply. In 1870 the Company became extinguished, and was carried under a new name—the Shoreham and District Water-Works Company—and in that year Aldrington, for the first time, was mentioned in the limits of supply. Section 5 of the Act gave the limits of supply as including Old and New Shoreham, Portslade, Kingston, Southwick, and Aldrington. Up to 1862, Brighton was supplied from the Brighton and Preston Constant Service Company; but in that year Brighton became anxious to acquire the works—in fact, they agreed to purchase them, and they brought in a Bill to confirm the purchase. Having regard to the fact that Aldrington was on the confines of their town, that the town was spreading in that direction, and that the locality was very insufficiently supplied with water, they included it within their limits of supply; but the Bill was strenuously opposed by the Shoreham Company, and ultimately it was agreed that Brighton should never again seek to supply Aldrington without the previous consent, in writing, of the Shoreham Company. It was, therefore, evident that Aldrington could get nothing from Brighton, because they were under no statutory power to supply it; and he should show that Shoreham was not in a position to give a supply sufficient for the requirements of the Aldrington Estate. Moreover, their parliamentary powers had expired, and their capital was exhausted. The promoters of the Bill, therefore, were driven to seek a supply from independent sources, and Mr. Quick, the eminent Engineer, having been called in, devised the scheme which was embraced in the Bill now before the House. The only petition against the Bill was that of the Shoreham and District Water-Works Company, and he thought he should disprove the allegations which it contained, and show that they could not, even if they desired, supply this estate with water. The proposed capital of the Company was £20,000, in 2000 shares of £10 each, and there were the usual borrowing powers to the extent of £5000. It might occur to some that, as the estimate for the works only amounted to £10,000, the proposed capital of the Company was excessive; but the promoters desired to be prepared for the development of the estate, and did not wish in a few years time to be obliged to come to Parliament again to obtain their sanction to the raising of additional capital. He could only add that the Local Government Board had suggested certain amendments in the original Bill, which the promoters had adopted.

The following evidence was then called:—

Mr. *Benett-Stanford*, M.P., examined by Mr. BAZALGETTE, said Mrs. Benett-Stanford was tenant for life of the estate which adjoined the Aldrington Estate. During the last few years the progress of building had been very rapid, and within eight years no less than 2131 houses had been erected on the Stanford Estate—detached and semi-detached villas. The Aldrington Estate combined about 600 acres, 569 being in the parish of Aldrington, and the remainder in Portslade. The estate was laid out for building, and, notwithstanding the depression of trade, he believed the work would be proceeded with at once. He believed the estate was ripe for building purposes, and there had already been made several broad roads through it, which connect with the main roads into Brighton. It was very conveniently situated so far as railway accommodation was concerned, the Portslade Station being on the estate. The water was to be pumped to a large service reservoir, situated on a high spur of the downs, known as Knobb Hill; and with the view to the future development of the estate, Aldrington Church was being rebuilt at a cost of £5000. The estate was purchased by him in 1877, with the view of laying it out as a building estate, and large sums of money had already been expended with that object. A large outfall sewer had been made, and what they now wanted was a good and sufficient supply of water. They had tried to obtain a supply of water elsewhere, but, failing in doing so, they were obliged to bring in this Bill.

Cross-examined by Mr. O'HARA: There were very few houses to be let on the Stanford Estate, but there might be more in Cliftonville proper. The brickmakers on the Aldrington Estate complained of the shortness of water, and said the Shoreham Company could not give them sufficient; and they were obliged to make borings and provide water for themselves. These borings were made last summer. He did not know if the Shoreham Company supplied the brickfields before he purchased the estate, or what quantity of water was required. He admitted that the Shoreham water was excellent, but the supply was insufficient. He was aware that the Company were asking for more capital, and proposed to construct additional works, but even then he was sure they would be unable to supply this estate. He was not sure that they would be able to get the extra capital, even if they obtained parliamentary powers. It would be very inconvenient if they had to wait for new works to be made by the Shoreham Company.

Mr. *George Gallard*, examined by Mr. BAZALGETTE, said he was one of the four owners of the Aldrington Estate, which he considered was now ripe for building. Fourteen acres of it had been sold to the Sussex Universal and Equitable Land Society, and they had covenanted to give them a sufficient supply of water at 9d. in the pound on the rateable value of the property, which was the charge in Brighton, and not at 1s. in the pound on the rack-rental, as charged by the Shoreham Company. They were also negotiating with others for the sale of land, and he himself had purchased some, upon which he intended shortly to build. About 30 acres of the land had been let to brickmakers, who had been obliged to get the water they required from the estate, because the Shoreham Company could not give them sufficient. The cost of the present supply had been about £4000. It would, he believed, seriously interfere with the development of the estate if a higher charge was made for the water than in Brighton. It would be of no use to ask Brighton for a supply, and the capital of the Shoreham Company was absolutely exhausted. There was an abundant supply of water where the promoters proposed to take it.

Mr. *Joseph Quick*, C.E., examined by Mr. BAZALGETTE.

I am a member of the firm of Quick and Son, of Great George Street, Westminster, and have had large experience in the construction of waterworks throughout the country. I made an examination of the Aldrington Estate, and prepared the plans of the proposed works. With their present works it would be impossible for the Shoreham Company to supply the Aldrington Estate. The springs at their disposal would not be sufficient for the purpose, and they could not increase their works without a heavy outlay. When the Aldrington Estate is developed there will probably be a population of 40,000 or 45,000 people, who would require a supply of water equal to one million gallons a day. The yield of the Shoreham Company in October was only 500,000 gallons a day, and only about half their district is supplied at the present time. Even assuming that they obtain the Provisional Order they are applying for, they would not be able to give us a sufficient supply, because with that Order they seek to include Steyning, Lancing, and other places in their district, with a population of 10,000. The Brighton Water-Works are within half a mile of the estate, but we could not look there for a supply, so that I was driven to lay out an independent course. The supply would be taken from the present well, and be pumped to a service reservoir at a sufficient elevation to supply all the estate. The reservoir will be at the north-eastern corner of the estate, and every part of the property will be supplied by gravitation. I believe the proposed works will give an ample and good supply of water to the estate. I drew up the estimate for the works, which will cost £10,000. They are based upon the usual calculations. That does not include the mains, some of which are already laid down. About £4000 will be required for extra mains, and the mains already laid have cost £4000. The capital proposed—£20,000—is a fair amount for the purposes of the Bill. There are engineering reasons why the Shoreham Company cannot supply the estate. Their reservoir is at too low a level, and their mains are too small. If the Shoreham Company were to carry on the works they have applied for power to construct, even then they would not be sufficient for supplying the district. I do not consider that the promoters are invading the Shoreham district; they are really only acting in self-defence. The promoters intend, by their Bill, to give a constant supply. The works will not, as alleged, be objectionable, and the reservoir will be covered in, so that people will scarcely know of its existence. I have been told that the Shoreham Company have exhibited great *laches* in supplying water, particularly at Portslade. Their capital, too, is exhausted, and they have had plenty of time to apply to Parliament for power to raise more money before this. They did not, however, apply till they heard that the Aldrington Estate Company were going to ask for parliamentary powers to supply themselves.

Cross-examined by Mr. O'HARA: The month of October is, perhaps, the driest time of the year. When I was there I saw Dr. Fuller, the Chairman of the Shoreham Company, who gave me every facility for ascertaining what was the present water supply. I told Dr. Fuller that there was plenty of water, but what he said was that it was not available for supplying the Aldrington Estate. I should consider it an invasion of the Shoreham district if this estate were already supplied with water. The estate will require over a million gallons per day, and it will be impossible for the Shoreham Company to give that quantity.

The CHAIRMAN: Does the Shoreham Company give a constant supply?

Witness: They profess to do so.

Mr. O'HARA: That is what they are bound to do under their Act of Parliament.

The CHAIRMAN: What distance is the Shoreham spring from the Aldrington Estate?

Witness: About five miles.

Mr. *J. P. Colbron*, C.E., examined by Mr. BAZALGETTE, said he was Surveyor to the Aldrington Estate, which he considered was ripe for building purposes. Nearly the whole of the sea frontage of Hove was built upon. The estate was laid out for building. Some of the roads were made, others were in process of formation, and the sea frontage had been groyned. He saw no reason why the water proposed to be supplied by the Company should not be quite as good as Brighton, which was said to be the best in England.

Cross-examined by Mr. O'HARA: I am not aware that Dr. Fuller, on behalf of the Shoreham Company, offered to buy all the mains which had been laid on the estate, and to supply us with water through them.

Mr. *John B. Blaker*, a farmer and market gardener at Portslade, proved that for the last four or five years he had been a large consumer of water. He was supplied by the Shoreham Company. The supply had always been deficient and unsatisfactory, and during the summer he was frequently without water for a week. He had made complaints, and the Company promised to remedy them, but had never done so.

Several other witnesses were called to prove the deficiency of the supply of water by the Shoreham Company, among others Mr. Ellice Clarke, Surveyor to the Hove Commissioners, who said he had had occasion to apply to the Shoreham Company for a supply of water for the Infectious Diseases Hospital, and their reply was that they could not furnish it.

Mr. BAZALGETTE: That concludes the case for the promoters.

Mr. O'HARA then addressed the Committee in opposition to the Bill, contending that it was a flagrant case of one Company attempting to invade the district of another. The Shoreham Company were incorpo-

rated by Act of Parliament in 1870, and a district was allotted to them. They were allowed five years in which to complete their works, so that their responsibilities and functions did not really begin until 1875. They had thus been in operation rather less than four years, and he should show by witnesses that, with the exception of a small district at the extreme end of Portslade, they had during that period given an ample and constant supply of pure water. They candidly admitted that the few persons living at the extreme end of Portslade had had some cause for complaint, but the Company were even now seeking for further parliamentary powers to enable them to meet the requirements of the outlying district of Portslade. It would be unfair, because the Shoreham Company had, during the short period of their existence, been unable to complete their arrangements for one small portion of their district, that, therefore, they should forfeit all the rights and interests they had acquired under an Act of Parliament. There was no evidence to show that the Shoreham Company had failed to do their duty, and he appealed to the Committee to throw out the Bill before them.

The following evidence was then called:—

Dr. *Thomas Fuller*, examined by Mr. O'Hara, said he had been practising at Shoreham for 25 years. He was Chairman of the Shoreham District Water-Works Company, and had been a Director of it ever since its establishment. They obtained their water from a spring in the parish of Old Shoreham. There was an ample supply of water at all times coming from that spring—enough to supply the whole of Brighton. Ever since the Act was passed in 1870, the Company had devoted themselves steadily to carrying out the works authorized by the Act. The district comprised Old and New Shoreham, Kingston, Southwick, Portslade-by-Sea, and Aldrington. The Company had just applied for a Provisional Order to enable them to complete arrangements for supplying not only Aldrington but other new districts—Lancing, Bramber, and Bayton. An Inspector from the Board of Trade had held an official inquiry into the subject, and he had reported in favour of the Provisional Order being granted. The Inspector stated that the quality of the Company's water was admittedly good, and that there was an abundant supply. He (Dr. Fuller) had every reason, therefore, to believe that the order would be granted. The Company were willing and anxious to supply the Aldrington district—indeed, they looked to that district to compensate them for the long time they had had to wait for a dividend. The Company paid no dividend at all until 1876. He had publicly told the representatives of the Aldrington Estate that the Shoreham Company would be prepared to supply them at 24 hours notice, and to purchase all their mains. The Company at present furnished a constant supply, except to the small district of Portslade, and that single deficiency would be remedied by the new works.

Cross-examined by Mr. Bazalgette: The present water supply of Brighton is about 4 million gallons per day. My statement that we could supply the whole of Brighton is based upon recent gaugings. Over 4 million gallons per day run to waste from our spring. That was the quantity only yesterday.

Mr. Bazalgette: What is your total available minimum supply?

Witness: Unlimited.

Mr. Bazalgette: Do you draw your supply from the sea, then?

Witness: From something equal to the sea—a sea underground.

WEDNESDAY, MARCH 19.

Mr. *George R. Stevenson*, C.E., examined by Mr. O'Hara, said in his opinion, when the Shoreham Company had constructed their new reservoir they would be perfectly able to supply the whole of the Aldrington Estate—indeed, with a very little improvement in their present arrangements, they could do it now. He considered it would be a great hardship on the Shoreham Company to allow this Bill to pass. According to his opinion, the promoters, by their proposed works, would be able to give to a portion of the Aldrington Estate only an intermittent supply, and that secured by pumping—always an objectionable thing. He gauged the Shoreham spring last week, when the maximum flow was about 5 million gallons. He believed the minimum yield was about 1 million gallons.

Cross-examined by Mr. Bazalgette: The minimum yield would be quite sufficient to meet the requirements of the district, including Aldrington, for many years to come.

By Sir John Duckworth: The gauging which he took represented the actual capacity of the spring, *plus* what was being pumped.

Cross-examination continued: I am not the Engineer of the Shoreham District Water-Works, nor have I studied the plans of their new works.

Mr. O'Hara said that was his case.

Mr. Bazalgette said he should like to recall Mr. Colbron, who could give some evidence which would set at rest the conflict between Dr. Fuller and Mr. Quick as to the yield of the spring.

The Chairman intimated that the Committee did not wish to hear any further evidence.

Mr. Bazalgette then proceeded to reply on the part of the promoters, contending that the opposition had entirely failed. They had been obliged to admit their guilt in regard to the insufficient supply, and all they could do was to ask that the extreme sentence of the law might not be imposed upon them. He denied, however, that they deserved any consideration, for, although they obtained their Act in 1870, and had had ample time to discover the insufficiency of their original works, they had taken no steps to obtain further powers until 1879, when they were alarmed, because other people were prepared to do what they had failed to do. Notwithstanding the evidence as to the yield of the springs, he contended that the works of the Shoreham Company were not such as to enable them to take full advantage of that yield, and that so far from their being able to supply the Aldrington Estate, in addition to their other district, he argued that when the Aldrington estate was fully built upon they would not be able to supply that alone. The Shoreham Company, in fact, simply asked the Committee to have a little patience—to wait a little longer, until they could complete new works; but that was a plea which they had for years been making in reply to the complaints of their customers, and the insincerity of that plea was proved by the fact that they had taken no steps to construct new works until this year. The time had come when the owners of the Aldrington Estate were fully entitled to reap the benefit of the large outlay they had incurred in laying down mains and preparing to give a water supply to their own estate. They had spent in that way £20,000, or two-thirds of the entire capital of the Shoreham Company. Dr. Fuller had talked of that Company being a poor one; but he admitted that they had paid 3½ per cent. for the first half of this year, and 7 per cent. was not so bad in these days, when they heard so much of the tightness of the Money Market. Another argument in favour of the promoters was that whereas the Shoreham Company had no motive to induce them to look to anything but their rates, the Aldrington Company would have to look to the enhanced letting value of their houses as their principal remuneration. This would induce them to give a good and cheap supply of water.

Mr. O'Hara: This Bill is to incorporate a Company, which may consist of anybody.

Mr. Bazalgette: But at present the Company consists of the four persons who are the owners of the estate, and they are not likely to allow it to pass out of their hands.

The room was then cleared. On the public being re-admitted,

The Chairman said: The Committee are of opinion that the preamble of the Bill is not proved.

Mr. O'Hara applied for costs, which were refused.

Legal Intelligence.

HIGH COURT OF JUSTICE.—CHANCERY DIVISION.

FRIDAY, MARCH 28.

(*Before Vice-Chancellor* HALL.)

In re THE CONTINENTAL GAS AND WATER COMPANY.

Upon the petition of a creditor, the voluntary liquidation of this Company was ordered to be continued under the supervision of this Court.

Mr. Robinson, Q.C., and Mr. Grosvenor Woods appeared for the petitioner; Mr. Church for a Director.

CLERKENWELL POLICE COURT.—TUESDAY, MARCH 25.

(*Before Mr.* HOSACK.)

UNLAWFULLY BURNING GAS.

Mr. *Edward Nash*, a licensed victualler, of 26, Warrington Gardens, Notting Hill, appeared on a summons, charged with unlawfully burning gas, the property of The Gaslight and Coke Company, at the Coach and Horses Tavern, Fann Street, Aldersgate Street.

Mr. John Humphreys, of the firm of Humphreys and Sons, solicitors, appeared on behalf of the Company; and Mr. C. F. Gill, barrister, appeared for the defendant.

From the evidence, it appeared that the defendant was formerly the landlord of the Coach and Horses Tavern, Fann Street, Aldersgate Street, and that, being in arrears for gas, a notice was sent him by the Gas Company, telling him that, if within a week the arrears were not paid, the gas would be cut off. The gas was cut off on the 24th of February, and a cap fixed on the meter, besides which a notice was placed there, warning persons not to remove the cap, and stating that, by connecting the pipes, they were liable to a penalty of £5, and 40s. for every day the gas was used. On the same afternoon the defendant went to a gas-fitter in the neighbourhood, and asked him to re-fix the pipes for him, but he refused. The same evening the pipes were connected, and the gas was set burning.

Mr. Gill, on the part of the defendant, did not deny that the offence had been committed, but stated that the Company had been told that the house was about to change hands, and that it was the custom for such outstanding debts to be paid when the new tenant came in.

Mr. Hosack ordered the defendant to pay a fine of £5 and costs, or, in default, one calendar month's imprisonment.

SOUTHWARK POLICE COURT.—THURSDAY, MARCH 27.

(*Before Mr.* BENSON.)

REFUSING TO PAY A GAS BILL.

Mr. *Hobart Shepherd*, solicitor, of 26, Smith Street, Chelsea, was summoned by Mr. A. E. Allen, one of the collectors of the Phœnix Gas Company, for neglecting and refusing to obey an order of the Court, made in March last year, for the payment of £4 7s. 1d., due to the Company for gas consumed by him in Queen's Road, Clapham.

The defendant did not appear.

Evidence having been given as to the serving of the order and the present summons, defendant was committed to Holloway prison for one month.

Miscellaneous News.

METROPOLIS WATER SUPPLY.

MEETING OF VESTRY DELEGATES IN ST. MARTIN'S-IN-THE-FIELDS.

An adjourned meeting of Delegates from the Vestries of the Metropolis was held last Thursday in the Vestry Hall of St. Martin's-in-the-Fields—Mr. Edward J. Watherston in the chair.

The Chairman said that the most serious matter for the consideration of the ratepayers of the Metropolis and the consumers of water was, not alone the increased and rapidly increasing value of the properties of the several Water Companies, owing to the principle upon which they were legally entitled to make their charges—upon annual value, with extras for high service, water-closets and fixed baths—but also the reduction of a largely unremunerative expenditure and the prevention of its continued augmentation by outlays for unnecessary works. Another matter of considerable interest to Londoners was the prevention of loss of life and property by fire. In order to show the enormous and rapid growth in the rateable valuable of Metropolitan property, he read a table showing the increase that had taken place in 30 parishes, where the values had risen more than 100 per cent. in the 20 years ending 1876. Among the most striking cases were those of St. Mary Abbott, Kensington, where the increase was 424·3 per cent.; St. John, Hampstead, 323; St. Mary, Battersea, 319·5; St. Mary, Stratford-le-Bow, 338; St. Leonard, Bromley, 301·8; Lee, 327·4; Penge, 338·3; and the Charterhouse, 444·8 per cent. The average increase in the rateable value was 104·7, showing a total increase of £11,827,650 in 20 years. Thus it had come about that the properties of the several Water Companies, which in 1856 were worth six millions sterling, were now roughly estimated at 26 millions, and unless a stop were put to their growing powers, they would before long be worth 35 millions. The work of the present Committee would be to propound a scheme which, while it should be fair and just to the present holders of water stock, should be satisfactory to the general body of consumers. He then reviewed the present condition of the water supply in the Metropolis, drawing attention to the varying rates charged by different Companies, and to the unsatisfactory state of the supply in many districts. In cases where the consumption of water had not been increased, the rates had been doubled, and even trebled. Other reasons for placing the control of the water supply in the hands of one body, responsible to the public, were that the expense of multiplied separate administrations would be avoided, and at least £100,000 saved in this way; the sanitary state of the Metropolis would be improved if a constant service were substituted for the pernicious cistern system; and more efficient means might be taken to prevent loss by fire. In Manchester, Liverpool, and Glasgow, where the pipes where all hydranted and kept at high pressure, in charge of the police, a great part of the separate fire brigade had been dispensed with. The best result now obtained in London was to confine a fire to the house in which it occurred; in Manchester the fire was, as a rule, confined to the room in which it occurred. In conclusion, then, he held that the existing arrangements for supplying the Metropolitan district with water were defective; that the defects were not merely of a temporary character, but were inherent to the system upon which the existing arrangements were based, so as to be permanently detrimental to the public interests; that it was absolutely necessary to remedy those defects in order to secure a better supply of pure and wholesome water, to be distributed under the constant system, and with such pressure and with such hydrant arrange-

ments as would render it available at a moment's notice for the purpose of extinguishing fires; that this could only be accomplished under a system of unity of management; that from the economies possible under such a system such alterations as might be necessary in the house-services should be made, not at private, but at public expense; and that in the absence of a municipal corporation, or of any representative body willing or competent to undertake the consolidation of the works, it was requisite that this should be accomplished by a Special Water Commission, responsible to the Local Government Board.

A resolution to the effect that the Chairman's speech should be printed and circulated was carried after some discussion, in which such strong opposition was shown to the suggestion that the proposed commission should be under the control of the Local Government Board that the Chairman consented to withdraw the obnoxious clause, and the resolution was then agreed to. The following resolution was adopted *nem. dis.* :—"That it is essential, for the protection of the ratepayers of the Metropolis, that the water companies should be united under one management, in order that uniformity and economy may be ensured; therefore that legislation for that purpose appears to this meeting to be imperatively necessary, to avoid the enormous increase in the water rates, which will be unavoidable from time to time under the Valuation (Metropolitan) Act, 1869," and the meeting again adjourned.

CAGLIARI GAS AND WATER COMPANY.

The Ordinary General Meeting of the Shareholders of this Company was held at the Offices, No. 3, Lothbury, on Tuesday, the 25th of March—Professor Erasmus Wilson, F.R.S., in the chair.

The Secretary (Mr. Rod. Mackay) having read the advertisment convening the meeting, the following report and accounts were submitted :—

The receipts on revenue account for the past year amount to £18,115 4s. 6d., and the expenditure to £8650 12s., leaving a clear net revenue for the year of £9464 12s. 6d.

The amount available for dividend, including the balance brought forward from the previous year, as shown on the balance-sheet, is		£12,042 15 11
Out of which an interim dividend at the rate of 5 per cent. per annum was paid for the half year ending June 30, 1878	£3,621 0 0	
The Directors recommend a dividend at the rate of 8 per cent. per annum for the half year ending Dec. 31, 1878, amounting to	5,809 12 0	
		9,430 12 0
Leaving a balance of		£2,612 3 11

The water receipts for the year show an increase of £379 over those of the previous year.

The gas receipts, from public and private lights, for the year, show an increase of £274.

The loss from gas leakage has averaged 8¾ per cent. of the make over the whole year.

The Shareholders will observe that the amount of the expenditure on capital account is £152,547 6s. 5d. It seems desirable that the amount of such expenditure should not exceed the authorized capital of the Company of £150,000, and the Directors propose to reduce the amount of this expenditure accordingly. They now recommend that £1000 out of the balance available should be applied for this purpose.

Mr. Joseph Maynard, one of the Directors, having resigned his seat in September last, the Board have elected Mr. H. P. Stephenson, a former Director, to fill the vacant office.

The Directors retiring by rotation are Mr. Erasmus Wilson and Mr. H. P. Stephenson, who, being eligible, offer themselves for re-election.

Revenue Account, for the Year ending Dec. 31, 1878.

Dr.			Cr.		
Maintenance of water-works—			Water—		
Reservoirs and filters in Corungiu	£82 9 4		The Italian Government, Province of Cagliari and Municipality of Cagliari . .	*£9,600 0 0	
Main to town	49 2 10		* By the 11th Article of the Concession, the fixed annual payment for the water supply in Cagliari is :—For the first 30 years, from 1867 to 1897, £9600; second 30 years, from 1897 to 1927, £7600; third 30 years, from 1927 to 1957, £5600.		
Reservoirs and mains in Cagliari	159 1 0				
Horse keep & miscellaneous	183 18 7				
Gas manufacture—					
Wages	738 15 6				
Coals.	2,115 1 9				
Stores	404 4 11				
General charges in Cagliari—					
Salaries	1,169 9 6				
Office rent, stationery, travelling expenses, &c. . .	117 3 8		From sundry customers, viz.—		
Rates and taxes in Cagliari .	1,023 5 4		For extra supply in Cagliari.	1,582 17 3	
General charges in London—			For supply beyond Cagliari.	1,038 2 5	
Directors and Auditors fees.	281 10 0		Ditto to shipping	162 9 4	
Salaries and office rent .	250 0 0		Gas—		
Stationery, bill stamps, and petty disbursements . .	35 18 4		Public lamps	1,396 9 10	
Prem. on insurance of works	30 0 0		Private lights	2,526 18 8	
Exchange on remittances . .	1,269 4 5		Products	1,304 4 6	
Interest and discounts . . .	501 6 10		Transfer fees	4 2 6	
Sinking-fund	150 0 0				
Reserve-fund.	100 0 0				
Balance—net profit for year carried to gen. balance sheet	9,464 12 6				
	£18,115 4 6			£18,115 4 6	

Capital Account and Balance-Sheet.

Gas and Water-Works—		Capital, authorized by Memorandum and Articles of Association, 7500 shares of £20 each	£150,000 0 0
Total amount expended, including preliminary expenses, to Dec. 31, 1877, per last account . .	£152,027 18 6		
Expended during year . .	519 7 11	7262 shares, subscribed to Dec. 31, 1878.	145,240 0 0
Cash at Company's Bankers, London	792 0 1	Debenture bonds	7,500 0 0
Cash at Cagliari	247 18 10	Sundry debts due by the Company	3,454 8 4
Sundry debts due to the Company	6,430 4 4	Sinking-fund	2,369 3 2
Bills receivable.	1,126 18 1	Special reserve-fund . . .	429 11 10
Special works executed . .	2,000 0 6	Revenue account, net profits—	
Stores on hand at Cagliari—		Balance, at Dec. 31, 1877 . . £11,259 1 5	
Coals	329 13 8	Less divs. paid for the year 1877 . . . 8,680 18 0	
Products	80 6 7		2,578 3 5
Goods	107 6 0	Year to Dec. 31, 1878 . .	9,464 12 6
Goods in transit	973 4 9		
Investment in share capital of Company (sinking-fund)	2,360 0 0		
Do. do. (special reserve-fund)	420 0 0		
Payment on account of dividend, Oct. 7, 1878 . . .	3,621 0 0		
	£171,035 19 3		£171,035 19 3

The Chairman, in moving the adoption of the report and accounts, said: Gentlemen, our meeting to-day will, I am happy to say, be of a somewhat routine character. We have no losses, and moderate profits; no electric light, and no exciting elements of any kind. Nevertheless, the report is one which I trust will be perfectly satisfactory to the Shareholders. It will be found that we are in a better position this year than we were last; and, looking at last year's account, we were better than in the year preceding; so that we are making slow but regular progress. We have not to deal with a huge Metropolis like London, or some of the other great cities of the world; but with a small island town upon the Mediterranean—one which is necessarily limited in its necessities both for light and water. But, as you will see, the water receipts of the present year show an increase of £379 over the previous year, and the previous year showed an increase of £474 over the year before. Therefore, there is not the same amount of increase this year as against last year, that there was last year as against the previous year. That must necessarily result from the fact of the place being comparatively thoroughly supplied with all it needs at present in the shape of water. Then, if we come to gas receipts, we find £274 increase over the past year, and last year the increase over the previous year was £292. Again, it is somewhat less in proportion as against last year, than the preceding year was as against that which went before it. Then comes a very satisfactory item—namely, the amount of gas leakage, which at one time caused us not only a good deal of anxiety, but of depreciation in our profits. You will see that the leakage was only 8¾ per cent., as against 10 per cent. in the preceding year. Our next item leads to the amount of our profit, and also to the manner of dealing with it. We are proposing, as you see, a dividend which will be equivalent to 6¼ per cent. for the whole year. There were years in our earlier career when we paid 7 per cent.; but, looking back, it is doubtful whether we paid it with as much propriety as ought to have been the case. We were successful at starting, and seemed to be in a position to pay such a high dividend; but, as we went on, difficulties occurred, and we were under the most disagreeable necessity of reducing, for a time, our dividend so low as 5 per cent. Happily it has now risen again, and we may hope that the time is not far distant when we shall be able to bring it up to the highest amount that was ever divided—viz., 7 per cent. But there is an item here which is of considerable importance, and which requires, and I think will receive, the support of the Shareholders. It relates to the fact that our capital account has crept up to a sum beyond that of the original capital of the Company. It has risen to £152,000, instead of £150,000, which was the authorized amount. The Directors are now desirous that this difference should be dealt with, and they propose that £1000 out of the balance of profit should be paid off. This seems to be only an act of honesty, which I have no doubt you will agree to. The excess in the capital originally did not arise from any act of dishonesty, but expenses seem to have crept upon us in such a manner as to increase our capital. I will not attempt to explain the accounts. I will simply say that if you have any questions to ask with regard to them, we shall be most happy to give you any explanations. With this short introduction, I beg to propose—"That the report of the Directors to the Shareholders, and the statement of accounts as submitted, be and they are hereby approved and adopted."

Mr. J. Aird seconded the motion.

Mr. Laing said the increased expenditure on gas appeared to be £493 over that of the previous year, and the increased receipts £357, showing a falling off of £136, instead of increased profit. There had generally been on the receipt side of the accounts an item for sundry works. Perhaps the Chairman would explain why there was no such item this year. There seemed to be an increase of about 20 shares per annum issued on the capital account. Since 1874 there had been 84 such shares issued. That appeared to be rather an odd item in a balance-sheet. The goods account last year was something like £500; this year it was only £107.

The Secretary said that was a fluctuating quantity. It simply represented the actual value of the goods in hand.

Mr. H. P. Stephenson said there was no increased profit on the gas account, and Mr. Laing's figures were quite correct upon that point. It arose from the fact that a ship was lost, and the Manager had to buy, at a higher price, local coal, which was not so suitable for gas purposes as the coal received from England. Very little "sundry work" had been done, and some was done for nothing. With regard to the increase of 20 shares, a sum of £250 was put by as a reserve-fund every year. That was invested in the shares of the Company at par, so that those shares were taken annually and added to the capital.

The resolution was then put and agreed to.

Mr. H. P. Stephenson moved the declaration of a dividend at the rate of 8 per cent. per annum, less income-tax, payable on and after the 7th of April.

Mr. Phillips seconded the motion, which was agreed to.

On the motion of Mr. Wigan, seconded by Mr. King, the retiring Directors—Mr. Erasmus Wilson and Mr. H. P. Stephenson—were re-elected.

The retiring Auditors—Mr. E. O. Coe and Mr. H. Bishop—were also re-appointed, and the proceedings terminated with the usual compliment to the Chairman and Directors.

THE DUKINFIELD, DENTON, AND HAUGHTON LOCAL BOARDS GAS-WORKS.

The Joint Gas Committee of the Dukinfield, Denton, and Haughton Local Boards recently called in Mr. T. Newbigging, C.E., of Manchester, to examine into the condition of their works, and the following is his report on the subject :—

To the Joint Gas Committee of the Dukinfield, Denton, and Haughton Local Boards.

Gentlemen,—I have made a careful inspection of your gas-works and district, and the results of my observations are embodied in the report which I have now the honour to present to you.

In pursuing my inquiries, I have had access to the books and such documents as I required to peruse; and any information asked for has been courteously supplied to me by your Law Clerk, the Manager, and the other servants of the respective Boards.

Of the various buildings on the site of the works at Dukinfield, I have nothing to say in commendation. The retort-house is about as cramped and confined as it is possible to be. It is 48 ft. 6 in. wide inside, and the side walls are only 15 feet high from the floor-line. The minimum dimensions for economy and comfort in working are 54 feet in width, and 22 feet in height respectively, and even these measurements may be exceeded with advantage.

The purifying-house is equally objectionable on the score of space and convenience, and the cutting of the tie-beams, to admit of the passage of the traveller used in raising the lids of the purifiers, has dangerously weakened the roof.

In any future extension of your carbonizing plant, I recommend the adoption of retorts rather than the large brick ovens you employ at present. The question of retorts *versus* ovens has long ago been settled by experience in favour of the former.

By adopting retorts instead of ovens, you would be able on the same floor-area to produce 500,000 cubic feet of gas per diem, which at present serves for the production of scarcely 300,000 cubic feet; or, to put it another way, seven-ninths of the floor-area occupied by the ovens alone would, if occupied by retorts, produce gas equal to your present maximum demands, and a proportionate reduction in your fuel (coke) account would result. The work of stoking would also be less arduous.

According to the returns, it would appear that a very large percentage of the coke produced is used for heating purposes. This was to be expected, to some extent, from the unsatisfactory condition of the old carbonizing plant; but the consumption of this material, judging by the sales, is so heavy as to cause me surprise, and I am inclined to believe

that some error may have arisen in taking stock at the beginning and end of the year.

The hydraulic main, and the other mountings of the benches containing the ovens, are generally in a very unsatisfactory condition.

It is imperative that something should be done in the way of extension of the manufacturing (carbonizing) plant during the coming summer, so that it may be completed in time for the ensuing winter's demands. During the shortest days of the present winter, the whole of the ovens and retorts were in use, and strained to their utmost capacity.

The bulk of the ovens are in a broken-down condition, and even if they are put into a state of repair, which they will have to be at a considerable cost, they will require supplementing either by additional ovens or retorts.

I am opposed to the erection of a single retort-stack in a house where there is room for a double one, having the retorts placed back to back, because the radiation of heat from the walls is greater than in the case of the latter, and the proportionate cost of construction is also greater. But the existing retort-house is of such meagre proportions that it would not contain a double stack of suitable dimensions, and certainly there could be neither comfort nor economy in the working of it. I am under the necessity, therefore, however unwillingly, of recommending, as a temporary expedient, the erection of another single series of benches on the unoccupied side of the northerly end of the house opposite to the existing single stack, leaving the central space between the two for the work of stoking. The present ovens that are the least dilapidated should also be put in good repair.

If this is done, the next lighting season will be tided over, and ample time will be allowed for maturing and preparing plans for any permanent alterations of the retort-house, or the erection of a new retort-house, to be carried out during the summer of next year. On this head it will be sufficient for me to indicate that a new retort-house and coal store could be erected on a portion of the vacant land at the south-westerly end of the plot, and at right angles to the present house, so that advantage might be taken, if desired, of the near proximity of the railway to connect the works thereto with a siding.

The condenser is in good condition, but it would be more effective in its action if it were raised, so that the base stood on a level with the yard.

The scrubber, which is only 17 feet high and 6 feet in diameter, and of sheet iron, is altogether unsuitable for the work it should perform.

The object of the scrubber is to remove the ammonia impurity from the gas, and it accomplishes this by the aid of water. Height is of importance in this vessel, and to effectually eliminate the ammonia from the gas, and secure it as a residual, you require a cast-iron vessel 8 feet in diameter, and 40 feet high, or two vessels 6 feet in diameter and 40 feet high, with the requisite water-distributing appliances. The cost of these would soon be recouped in the increased income you would derive from the sale of the ammoniacal product. In erecting this apparatus, the connections should be arranged so that the gas shall be forced, not drawn, through it by the exhauster, as is done at present.

The rotary exhauster recently fixed is a most efficient apparatus, and with the steam regulator attached performs its work in an admirable manner. It relieves the retorts of back pressure, and largely increases the production of gas per ton of material carbonized.

The machine is adapted for a make of 25,090 cubic feet of gas per hour, and when the production reaches that quantity it should be supplemented by another of similar capacity. In that case both would be at work in the heavy lighting period of the year, and one in summer.

In the purification of the gas you employ oxide of iron exclusively. In the use of this purifying material nuisance is avoided, and it is an economical agent to employ; but whilst it entirely removes the sulphuretted hydrogen, which is the most objectionable impurity, it leaves the carbonic acid untouched. The effect of this latter remaining in the gas is to reduce the illuminating power about 1½ candles below what it would otherwise be.

The remedy is to put down two more purifying vessels of the capacity of the existing ones, to be charged with lime, and used exclusively after the oxide vessels for the arrestation of the carbonic acid.

In this way there would still be an absence of nuisance, because the sulphuretted hydrogen, being previously abstracted, would leave only the carbonic acid, and this, combining with the lime, would simply produce carbonate of lime, which gives off little or no odour; and if worked up with water in a mortar mill, with a small proportion of ordinary clay, it could be utilized as luting for the retort-lids.

The station-meter is of barely sufficient capacity for the present maximum production, and the journals of the drum-shaft are worn, and in need of repair.

The two governors for the Dukinfield and Denton districts respectively require overhauling, to render their action more sensitive; otherwise they appear to be in working order.

With another suggestion of your Manager I entirely agree—viz., the desirability of dispensing with the unprofitable main-pipe leading to Denton through the Plantation Farm fields. This and the leading main supplying Dukinfield could readily be carried over a bridge, of which they might be made to enter into the construction, across the canal, and then branch off in either direction.

The gasholders are in fair condition, and their total working storeage capacity, including the holder at Denton, is 354,000 cubic feet. This is equivalent to only three-fourths the maximum daily production, which amounted to 472,000 cubic feet during the present winter.

In a manufacturing district such as yours, it is desirable, on economical grounds, that the storeage should be at least equal to the greatest make per diem (24 hours); when this is so, the retorts or ovens are kept going with more regularity, and a smaller number suffices. Owing to the insufficient storeage for gas, a portion of the carbonizing plant required to be in action in winter is standing off during the earlier part of each week, and the cost for wear and tear and wages is thus greater than would be the case under more favourable circumstances.

The valves on the inlet and outlet pipes of the smaller holder need replacing by others of better construction.

The works throughout are kept in a clean and orderly state, and in my experience this, in a gas-works, as elsewhere, is a healthy sign.

I tested the gas for sulphuretted hydrogen and ammonia. It was entirely free from the former impurity, but the latter was sensibly present, due to the deficient scrubbing arrangements.

The illuminating power, as indicated by the jet photometer, was equal to 18 standard sperm candles. This is 3 candles, or 20 per cent., higher than is provided for in the special Act.

I have rambled over a large portion of the district during the lighting hours at night, unknown to the Manager, and my observations confirm the tests of the illuminating power. More attention might be devoted with advantage to the cleaning of the street-lamps.

It is of importance that a Bunsen photometer (I recommend the Sugg-Letheby) be obtained for testing. The jet offers a ready means of ascertaining, by a momentary inspection, that the carbonization is being conducted with regularity, and that the materials used are up to the mark; but the other instrument is the more satisfactory guide in determining the exact illuminating power. It requires to be fixed in a room specially arranged for its reception, and I find no such room on the works that I can recommend as suitable for the purpose.

The loading of the tar and ammoniacal liquor into the canal barges would be accomplished with much greater expedition, thus indirectly enhancing their value, if a cistern were erected at some convenient point, say at the northerly end of the retort-house, into which the residuals could be pumped at leisure, and then run direct into the barges. This would also increase the storeage room for these residuals, which at present is too restricted for the production.

The approach to the works would be greatly improved if the gradient in the road were altered in the manner suggested by your Manager—say, by reducing the sudden rise, and running out the road to the north-westerly corner of the vacant land. This could be done at a small expense; and if the Committee will stand for an hour, as I have done, and witness the exertions of the men and animals removing the coke in carts from the works up the steep ascent from the canal, they will, I think, come to the conclusion that this is a duty which calls for their early attention. From a pecuniary point of view, it would pay to make the alteration proposed, as the coke would necessarily be increased in value as the cost of haulage is diminished.

From the returns that have been furnished to me, I find that the leakage, or unaccounted-for gas, has averaged 23·22 per cent. of the make per annum during the last ten years, and in the past year it has reached 29·24 per cent. It is proper to state that in this is included the gas consumed on the works, none of which is registered by special meter, as unquestionably it ought to be.

This heavy percentage of gas unaccounted for during the year is readily explained. In the first place, a considerable portion of the district is undermined by coal-getting, causing a subsidence of the ground, which loosens and draws or breaks the joints of the pipes.

2. A proportion of the loss is due to the breakage of the leading main, caused by the bursting of the canal bank. Although the accident in question occurred in December, 1877, yet some weeks elapsed before the reinstatement of the main could be effected, and in the interval there was considerable leakage.

3. The unusually severe winter has aggravated the various sources of leakage, and has been the cause of others.

4. The work of enlargement, renewal, and extension of mains and service-pipes, has been prosecuted with vigour during the greater part of the year; and work of this kind necessarily and unavoidably results in a greater or less amount of loss of gas.

Nevertheless, the good effect of this policy of enlarging the mains is beyond question—it was a matter of pressing necessity, and the results, I venture to predict, will be speedily apparent, not only in the ample supply of gas to the consumers, but in the reduced pressure, throughout the district, at which you will be able to afford the required supply, and the consequently diminished leakage.

In the course of my investigations, I have visited every portion of your extensive district, and have noted the various enlargements of mains and extensions that have been made. I express my general concurrence in these extensions and enlargements; and if in one or two places—in Haughton, for example—the mains may be considered somewhat ample, the fault, if such it can be called, is on the safe side, as no better opportunity may again present itself, seeing that iron is so low in price, for carrying out the much-needed improvements.

In the hands of the Company, the policy of "starving" the district had been pursued to a considerable degree, as is evidenced both by the small mains that have been removed and by those that still exist, and it required the application of drastic remedies to restore the distributory plant to a satisfactory condition. Under the control of a timid or less competent Manager, this state of things might have been perpetuated, and the consequences to the gas consumers and the ratepayers generally would assuredly have been disastrous.

Much still remains to be done in the distributory department. There are many long streets with pipes of 2 inches diameter, and even of smaller calibre, running through them, with a good class of consumers on both sides, who are supplied from these small mains. They all need replacing by mains of larger size.

The same remark is applicable to the numerous service-pipes of small bore that are in use.

The leakages, of which there have been many complaints of late, are principally due, in my opinion, to the intense frost that has prevailed. Similar complaints have been general throughout the country. I have seen the joints of the new mains bared in different parts of the district, and in all but one instance they were sound and good. A considerable leak was caused by a drawn joint in the Crescent Road; but, taking into account the duration and severity of the recent frost, the unusual depth to which it penetrated the ground, and the steep character of the road in question, it is not surprising that the leakage should have occurred.

I have examined a number of meters that have lately been taken out and replaced by new ones. They were all in wretchedly bad condition; and if, as I am assured, there are still hundreds of a similar character in use, it is scarcely matter for wonder that the percentage of unaccounted-for gas should be high.

The Denton main was originally so laid, probably to supply the gas-holder erected at the latter place, and about 1¾ mile distant from the works. But this holder is altogether a mistake—there is no necessity for it in its present position. The day consumption in Denton and Haughton, for which it is exclusively used, could as easily and economically be supplied from the works through the main laid in the other direction as proposed.

In the foregoing remarks I have been careful to recommend nothing but what would be advantageous to the works, and most of the alterations and additions are imperatively required.

Notwithstanding the disadvantages under which you labour, the results of your working in regard to cost per 1000 cubic feet of gas sold are such that they are surpassed by few other gas-works in the kingdom.

By a judicious outlay on improved apparatus, buildings, and plant, and under ordinary good management, your gas property will be found to prove a valuable acquisition. The invested capital is moderate in amount, whilst your district of supply embraces a good class of consumers, is of large extent, and improving daily.

The consumption of gas in the two districts during the year ending Dec. 31, 1878, has been—

Dukinfield	34,598,779 cubic feet,	or 55·91 per cent.
Denton and Haughton .	27,276,931 „	„ 44·09 „
Total	61,875,710	

This is inclusive of the quantity consumed in the public lamps.

During the past ten years the consumption in both districts has more than doubled, the actual increase being—

Dukinfield	105·65 per cent. increase.
Denton and Haughton	114·04 „ „

On the question of erecting separate works for the supply of the districts of Denton and Haughton, which, under the Dukinfield and Denton Local Boards (Gas) Act, 1877, is admissible on compliance with

the provisions there laid down, my advice is that if there exists, or is likely to arise in the future, any grave divergence of opinion on the manner of conducting the works under present arrangements, a decision to erect new works at Denton should be come to at once.

On the other hand, if the several Boards believe that they can work together harmoniously in the conduct of their joint property, it will be found of advantage to concentrate the manufacturing power under one management, on the existing site at Dukinfield.

For reasons that will be apparent to the Committee, one large works, if properly administered, is more remunerative than two smaller works occupying different portions of the same district, and under separate management.

There is sufficient spare land at Dukinfield, on the present, site to allow of extensions, which, taking the ratio of increase of business during the past ten years, would serve for twelve years to come. If a separation were decided on, the present manufacturing site would be considerably in excess of the requirements of the Dukinfield Board for a length of time, and, unless otherwise profitably utilized, would be a burden on the concern.

Giving full weight to these considerations, it is for the respective Boards to come to a decision on the question. It is important that an early understanding should be arrived at, in order to admit of a clear decision as to what additions to plant should be made on the existing works. The additions which in this report I have recommended to be made to the plant at Dukinfield, are on the assumption that all the gas will continue to be manufactured there, and they would be greatly modified if the district is to be divided.

Presuming that it is decided to erect separate works for the joint supply of Denton and Haughton, it is of the first importance that the site chosen should be the best that can be obtained for the purpose, having in view all the different circumstances that should influence the selection. Any mistake made on this point would entail a permanent charge on the operations of the gas enterprise.

There are several weighty objections to the site proposed, where the existing holder is erected. In the first place, it is situated at about the highest inhabited part of the district. This, taken alone, would not constitute an insuperable objection, as the district is fairly uniform as regards level throughout; at the same time, if an equally eligible plot of land on a lower level can be secured at a price equally reasonable, it should be preferred. Its distance from railway and water communication is a matter of more serious concern. The whole of the raw material would have to be carted to it at considerable expense, and the residual products—coke, tar, and ammoniacal liquor—removed in like manner. The bulk of the traffic, assuming that the coal were delivered at Denton Railway Station, would be through the best portion of the town, and this traffic would increase as the business developed.

In your Manager (Mr. Bridge) you have a man of great practical ability and unbounded energy, and the good effect of the improvements he has inaugurated will become more apparent year by year.

I have been thus explicit in my observations, desiring to act up to the instructions I received—viz., that I was to leave no point uninvestigated, and to be perfectly open in my remarks, especially on all matters pertaining to the present management.

I remain, Gentlemen,
Your obedient servant,
THOS. NEWBIGGING, M. Inst. C.E.

5, Norfolk Street, Manchester, Feb. 27, 1879.

EXHIBITION OF GAS APPARATUS AT KEIGHLEY.

On Wednesday, the 19th ult., an exhibition of gas-stoves, engines, ovens, burners, and other apparatus for the domestic use of gas, was opened at the Mechanics Institute and Rink, Keighley, by Mr. B. S. BRIGG, Chairman of the Local Board. This is the first time any exhibition of the kind has been held in Keighley, and its novelty has excited, since the opening, a gratifying amount of interest on the part of the large numbers who have already inspected it. Our readers are aware that exhibitions of a similar nature have previously been held in Birmingham, Wolverhampton, Manchester, and Bradford. At the last-named town the exhibition was an almost unprecedented success, both as regards the attention bestowed upon it, and the quality of the exhibits. It could not be expected that, in a town so small, in comparison with any of the others mentioned, as Keighley is, the same success would be met with; but it is safe to say that the expectations of the Gas Committee, under whose auspices the exhibition is being held, are being more than realized. The Mechanics Institute has very suitable accommodation for the effective display of a large assortment of such apparatus, and its rooms are so capacious that comparatively little inconvenience is experienced from the heat which necessarily attends the working of them. There were present at the opening, Mr. N. A. Aldersley, Chairman of the Gas Committee; Messrs. J. Gledhill and G. Houldsworth, members of the Local Board; Mr. John Laycock, the Gas Manager, and a fair attendance of the public. In opening the exhibition,

Mr. BRIGG said he wished to direct the attention of those present to some of the results which it was hoped would be attained by this movement. Since the first Great Exhibition, nearly 30 years ago, they had all been tolerably familiar with exhibitions of one sort and another; but he believed that, to the majority of those who would visit the Mechanics Institution during the next few days, a gas exhibition would possess the advantage of novelty. Scientific men told them that if they would rightly understand the causes of many phenomena, they must not expect to find them always lying upon the surface; that, for instance, if they would know something of the formation and nature of coal, they must carry their minds back to a very remote period, and picture for themselves a vast vegetable growth absorbing and storing up heat and light for use in generations to come. In a smaller degree, if they would rightly understand the nature of this exhibition, they must carry their minds down to the new gas-works at Thwaites. That was not the time to enter into an explanation of the causes which led to the erection of those works; but he was justified in saying, on the authority of people better qualified than himself to form an opinion, that of them they might be justly proud. They owed them entirely to the supervision of a townsman—Mr. John Laycock, the Gas Superintendent—and they would do credit, he believed, to the most experienced and able gas engineer in the country. People in Yorkshire, however, and especially in Keighley, were inclined to find fault; they were apt to be impatient of existing arrangements, and disposed to grumble. A gentleman said to him the other day, "These works are well arranged, and all that; but they are too large. You make about 100 million cubic feet of gas in the year, or 275,000 feet per day, and yet you tell me the works are capable of producing a million cubic feet for daily consumption." He was obliged to acknowledge that these figures were perfectly correct. Unfortunately, for gas managers and shareholders, users were not by any means disposed to consume their gas in a methodical manner—they would use it only just when they wanted it; and so, during the depths of winter, there was a daily make of something like 700,000 cubic feet, whereas, during the fine days of summer, the make fell down to less than 100,000 feet. Under these circumstances, it was evident that these works must be carried on at a great disadvantage; capital being sunk, and only one-seventh or one-tenth of what it was capable of yielding being extracted from it. So the consumption by day was very much less than by night; and the question which the Gas Committee had before them was, how they could increase that consumption during the day and in the summer time. It was pretty evident that it could not be obtained by increased lighting. The largest shareholder would be scarcely prepared to block up his windows in order that he might enjoy his favourite light. That method being done away, there were two others left. Gas might be very largely used in connection with machinery, and also for heating purposes. The latter use affected the great bulk of the population, the question for whom was, whether gas could be satisfactorily employed for cooking and warming. All would agree that if it were simply a question of convenience, gas would bear the palm from coal; but there was undoubtedly a prejudice with regard to it—first, respecting its cost; and, secondly, because it was said that the use of gas in cooking had an injurious and unpleasant effect upon the meat. With regard to the cost, he would refer them to a very exhaustive statement published with the catalogue, respecting a series of experiments conducted by Mr. Lewis Thompson, a well-known analytical chemist, from which it appeared that the relative cost of boiling water by gas and coal was as 3½ to 1 in favour of gas, with a saving of time of two-thirds. With regard to the prejudice against its use for cooking purposes, he thought if a coal fire were to be placed in the middle of the lecture-hall, people would suffer severely from the inconvenience of it. But it by no means followed that fires could not be lighted in our houses so as to be both comfortable and free from noisomeness. So it was with the gas-cooking apparatus; and wherever noisomeness or deleterious effects had been produced by it, there had been either imperfections in the apparatus, or an insufficiency of ventilation. They might be perfectly sure that, in buying a stove from some of the makers, who had devoted considerable scientific attainments to the matter, they would have a satisfactory result. He could not conclude without saying a word with regard to another question that had caused some excitement in gas circles—the question of electric lighting. Though his own interests were allied more closely with gas, he had no prejudice against the electric light. But those who had seen it, either in the Avenue de l'Opéra in Paris, or on the Thames Embankment in London, would agree that it was a much better light than that given by gas. But it must be remembered that they were dealing with an article of very enhanced cost as compared with gas; and there was a capability in gas for public lighting which had not yet been fully tested. A kind of irony, too, seemed to attach to the fact that the best possible means of producing the electric light were actually obtained by using gas in working the engine employed for driving the machines which generated the electric force. So that the electric light owed its very origin to that which its believers were disposed to regard as worn out as a means of lighting. In his opinion, we had not by any means seen the limit of cheapness in gas. It had been the constant endeavour of the Keighley Gas Committee, for many years past, to produce gas at a low price, and it was their intention to go on in the same course. Neither had the limits of its usefulness been reached; and one of the new fields for its employment was to be found in the use of the apparatus before them. He had to ask those present and their friends to come to this exhibition, to see for themselves in what ways gas could be economically used, and he hoped also to be purchasers of apparatus, and constant consumers of gas afterwards. He had pleasure in declaring the exhibition open, and he trusted that it would meet with a full measure of success.

On the motion of Mr. ALDERSLEY, a vote of thanks was then accorded to Mr. Brigg.

The *Keighley News*, in reporting upon the exhibits, says: "The beauty and finish of many of the articles on view, apart from their ingenious construction and usefulness, and the uncommon nature of the exhibition, will commend it to every visitor. The first name upon the catalogue is that of Messrs. S. Leoni and Co., of London, who occupy a large stand in the centre of the room. The superior nature of this firm's manufactures entitles them to the success which they have met with wherever their goods have become known. In point of completeness and elegance of construction their stoves are perhaps unrivalled, and although costing more than the productions of many other manufacturers, are the cheapest in the long run, and pretty sure to give entire satisfaction. Perhaps the most generally useful stove for cooking purposes among their large collection is the 'Nonpareil Family Kitchener,' which, like the rest, is lined with porous tiles, by which the heat is absorbed and retained for a long time after the gas has been extinguished, so that the cooking process can be completed at a less expense than it otherwise would be. The heating arrangements are such that the temperature of the oven can be raised to 500° in ten minutes. All the stoves made by this firm are fitted with stone-nipple burners, which resist the wasting action of the heat. Among stoves for heating purposes alone, one which will earn a good share of favour is the 'Ladies Favourite,' in which a capital effect is produced by placing ordinary atmospheric burners under fire-clay 'coals,' with holes in which little platinum nets are fixed; and this imitation of a coal fire, when heated red hot, presents an appearance very similar to an ordinary grate. Messrs. Leoni also show a large number of other stoves of greater and less capacity, all of which, like every cooking appliance in the exhibition, are made on one of two principles—either being so arranged that the heat is furnished underneath by gas burnt as in the Bunsen flame, or provided with reflectors which throw down the heat of an ordinary flame upon the food. The former of these methods is the more largely adopted for cooking purposes, although some of the stoves combine both; and the latter is chiefly used in what are known by the generic term of 'Cheerfuls,' which serve the purpose of warming rooms, and are made to look something like a coal fire by the use of polished copper sheets to throw off the light.

"Next on the list are Messrs. Geo. E. Webster and Co., of Leeds, who exhibit a selection of burners and globes, and among whose specialities are an automatic photometer, which, by the rate of the fall of two cylinders, shows the consumption of the gas by burners attached to each, and the quality of the gas by the density of two shadows, which are produced by the interception of a small wire between the flames and a white surface. They also show a burner dubbed 'The Light of the Future,' for which it is claimed that the burning of two jets side by side, and touching one another, gives a better and more economical flame.

"A most interesting collection of cooking-stoves is the one contributed by Mr. Charles Wilson, of Leeds. A feature of all of them is that in the middle of the doors of the ovens is inserted a strip of glass, which enables the cook to see how the culinary operations are progressing, without opening the door and admitting cold air. A silver medal was awarded at the Birmingham exhibition to Mr. Wilson's stove, one of which is fitted with a plate-warmer and a copper boiler. A similar award was gained by a gas kitchener of his designing, which had been extensively used in schools of cookery. In some of these stoves a fine wire gauze is fixed, which, when heated, will grill chops or steaks in a very short time, and in one stove, the maker says, will roast a joint. A very light stove of sheet iron, with the merit of exceeding cheapness, is here exhibited for the first time, in commemoration of which Mr. Wilson proposed to christen it 'The Keighley Stove.'

"Of local exhibitors, Mr. Robert Holmes, ironmonger, Keighley, is one. He shows a variety of burners and lamps by different makers, and a neat

little stand for supporting a kettle over a gas-flame. Recommended by this exhibitor, as by one or two others, is Fielding's patent gas fire-lighter. This is a handy little article, which, when thrust between the bars of a fireplace, will in three minutes ignite a fire without paper or wood.

"In the front rank, among makers of economic appliances for the use of gas, are Messrs. J. Wright and Co., of Birmingham, who have on view a very extensive assortment of their goods. A cooking-stove, on the reflecting principle, with boiler and griller, was awarded a silver medal at Wolverhampton; and at Birmingham, a low-priced stove of their manufacture obtained a similar honour. As a rule, they devote themselves to the making of goods at 'popular prices,' the workmanship of which is such as to merit distinction.

"Mr. William Sugg, the well-known gas engineer, of Westminster, has forwarded a case of gas apparatus, which is shown for him by the Gas Committee, and which is unequalled in the exhibition. It was brought from the Paris Exhibition of last summer to Bradford, and, as shown at Keighley, undoubtedly forms the most attractive object in the lecture-hall. It contains choice and elegant specimens of painted globes, burners, brackets, and shades, included among which are two large 80-candle Argand burners, with three concentric rings of flame, and of the same make as those which recently were erected on the Thames Embankment to compare the respective illuminating powers of gas and the electric light, several 7-inch Christiania burners, a consumer's double governor, showing the principle upon which all governors attached Mr. Sugg's burners are constructed, and a chaste selection of metal pillars. The taste displayed in the construction and ornamentation of one and all the exhibits displayed in this case will doubtless render it a great attraction to every person who examines it. Mr. Sugg is not approached by any other maker of similar specialities.

"On the same side of the hall, and nearer the door, Messrs. Beverley and Wylde, of Leeds, are represented by 15 cooking and warming stoves, on the whole very well got up. In connection with the majority of them, a double wrought-iron casing forms the walls of the oven, and serves the purpose of retaining the heat—and hence of saving gas—more efficiently than a single sheet of iron would do. 'The Bachelor'—a portable stove for very little money, with an atmospheric burner, for roasting, boiling, and grilling—is said to burn only 4 feet of gas per hour.

"Mr. James Stott, of Oldham, is the only exhibitor in the lecture-hall remaining for notice, and his exhibits consist mainly of governors to regulate the pressure of gas, two of which are in action.

"In the skating rink, which is quite as attractive as the larger room, Messrs. Taylor and Parsons, of Bradford, are exhibitors of a remarkably varied and extensive assortment of appliances on behalf of themselves and several other makers and patentees. Amongst their own exhibits are a hot-water coil for heating a vestibule and entrance-hall; a baking and roasting oven, which is heated by the combustion of gas or air applied to its exterior; an apparatus for heating three or four flat-irons, without soiling them as a coal-fire does; and a quantity of pretty burners and shades. For Mr. Maughan, of London, they exhibit a noteworthy rapid water-heater, called 'The Geyser.' This is a copper cylinder of a foot in diameter, and about 24 inches high. The water flows in at the top in a regular stream, and passes through 200 fine spiral tubes, which are surrounded by highly-heated air. The effect of the spiral is to retard, by capillary attraction, the progress of the water from the upper to a lower compartment, and thus, by the time it reaches the bottom, it is sufficiently heated for use. It is capable of heating two gallons of water per minute, and will prove of inestimable service in a household. On behalf of Mr. C. Shrewsbury, of Norwood, they show a bath, which, when full, can be heated to any required temperature in from half an hour to 40 minutes. They have also charge of several of Messrs. Virgo and Akeroyd's lamps, in some of which the air supply for supporting combustion approaches the flame by a regulator at the top of the shade, and is warmed before uniting with the gas, the result being, it is asserted, that the gas is expanded at the point of ignition, and complete combustion guaranteed. A French arrangement for lighting gas by electricity, placed on view by this firm, is worthy of a word of explanation. At the side of any burner, and fastened upon the gas-pipe, is a small apparatus holding the two opposite poles of the current, which is derived from a single cell. The current runs along the gas-pipe to one pole, and is conveyed by a wire to the other. By turning the tap, a connection is made between the poles, and the current passes, rendering an intermediate bit of platinum white hot. The tap also emits the gas from the burner about an inch above, and also from a minute perforation just over the platinum, where the ignition first takes place, from which the light is communicated to the burner above at the same instant. The introducer of the notion into this country claims that it is easily applied, and that it is much simpler than the induction coil which has been applied to a similar purpose. Messrs. Taylor and Parsons also show Dr. Bohn's arrangement for warming rooms, and, on behalf of Mr. Thomas Nock, of Birmingham, a very complete gas-cooking apparatus, with stock-pot, and 'Bain Marie' pan; and other modifications thereof. For Messrs. Hassall and Singleton, of Birmingham, they display nine gas-stoves with a wide range of prices, and a 'Birmingham Combined Gas and Coal Range,' the largest article of the kind exhibited in the exhibition, and which is placed near the entrance to the rink.

"Coming to apparatus of a totally different kind—engines by which gas is applied to the working of machinery—the most prominent object of this description is a 3-horse power engine, exhibited by Messrs. S. Clayton and Co., of Paradise Street, Bradford. It is the first engine of the kind made by this firm, and is good as an initial attempt. The stroke is 12 inches in length, and the diameter of the cylinder is 6½ inches. The fly-wheel makes between 130 and 140 revolutions per minute; and when working upon its full complement of machinery, it causes a combustion of gas once every two revolutions, the number of explosions being, however, reduced when it runs by itself, as exhibited. More noiseless and less cumbersome are the two engines, of 1 and 3½-horse power respectively, which represent Messrs. Crossley Bros., of Manchester, and are shown for them by Mr. James Crabtree, of Bradford. The excellence, in point of design, workmanship, and finish, of these absolutely silent horizontal engines, are so manifest to every visitor that they command universal admiration. The principle of the combustion which takes place in 'The Otto,' as this invention has been named, is new. It avoids an explosion, strictly so-called, by being so arranged that only a partial ignition of gas and air takes place at the beginning of the stroke, the remainder of the gas admitted being thus expanded, and economy as well as noiselessness secured. Its principal peculiarity is that it ignites the charge of mixed gas and air when this charge is compressed to about 30 lbs. per inch above atmospheric pressure. When running against small resistance, the governor allows the admission of gas but once in every 12 revolutions; but when the engine is fully loaded, the gas is burnt every two revolutions. The indicator diagrams taken during its working are eminently satisfactory. Messrs. Crossley make 'The Otto' up to 30-horse power, and the price charged for it is reasonable, the working parts being few and simple. The three engines noticed are the only ones in the exhibition; but a much better selection within the same limits could not have been made.

"A good collection of cheap stoves, adapted to the wants of working people, is that of Messrs. Siddaway and Sons, of West Bromwich. Mr. J. W. Laycock, ironmonger, of Keighley, among eight exhibits, has a cheap and economical 'Short's superheated steam cooking-pan,' and the albo-carbon light; and he exhibits for Messrs. George Bray and Co., of Leeds, a collection of standard jet burners, some of which equal 80 sperm candles, and a sort of historical assortment of burners used during the past 20 years. Messrs. Bray have just obtained a name for their burners, two of which are fixed at the main entrance of the Institute, and every night shame out of countenance all neighbouring lights. For Messrs. Heaps and Wheatley, of Brotherton, Mr. Laycock also puts on view a copper circulating apparatus for a lobby or greenhouse, a 'save-all' cookery steamer, and other appliances. Mr. J. Williamson, of Hatton Garden, London, exhibits a 'Handy' cooking-stove for the use of a single individual, and a couple of stoves known as the 'Duplex' and 'Special,' which obtained honourable mention at the Birmingham Exhibition. They are all made with cast-iron stands and tubes at the corners. The stoves of Messrs. Billing and Co., of Bloomsbury, London, merit attention, as being of considerable variety and neatness. Mr. T. H. Haynes, of Gracechurch Street, London, shows Schooley's mercurial gas-regulator, which, if one may judge from the specimen on view, serves its purpose admirably. Mr. J. E. Prust, of Birmingham, also has a capital selection of inexpensive culinary stoves, one of which, 'The Favourite,' was distinguished at Birmingham by a silver medal.

"The only exhibits that now remain unnoticed are those of the Keighley Gas Department itself, which are partly distributed in each building. They comprise various apparatus used in the making, testing, and burning of gas, an inspection of which will afford both pleasure and instruction. We must not pass unmentioned the services of Mr. John Laycock, the Manager of the Department, upon whom much of the responsibility of arranging the exhibition has fallen. In the lecture-hall, the Department contributes samples of coal and cannel, coke, carbon, tar and its products, ammoniacal liquor and its products, and oxide of iron, together with Messrs. Kirkham and Sugg's jet photometer, and specimens of dry and wet meters with glass fronts. They display for Messrs. Tunstall and Co., of Newlay, some exceedingly interesting coal tar products; for Messrs. Bailes and Hallsworth, of Armley, samples of products derived from oxide of iron after it has been used in gas purification, among the most attractive of which are a number of aniline dyes; and for Messrs. Nicholson and Son, of Hunslet, a bottle containing sulphuric acid of unusual purity, derived from the same base. In the rink, their chief exhibits are Evans's photometer, which is the Government test used by almost all gas companies; Peebles's gas-governors; a meter and pillars for testing burners; and a comprehensive assortment of burners and globes."

The exhibition closed on the 22nd ult.

THE ELECTRIC LIGHT ON THE THAMES EMBANKMENT.

The following report on the experiment of lighting the Victoria Embankment by means of electricity was presented to the Metropolitan Board of Works, at their meeting on Friday last, by their Engineer (Sir Joseph Bazalgette), and their Consulting Chemist (Mr. T. W. Keates):—

We beg to report that we had an interview with Mr. Head, of the firm of Ransomes, Sims, and Head, on the 18th inst., and then arranged with him, according to the instructions of the Board, that the steam-engine driving the dynamo-electric machines on the Embankment should be allowed to remain for an additional three months, from the 16th inst., for a gross sum of £100, the cost of bringing the engine from Ipswich to London, and of re-conveying the same to Ipswich when the experiment is completed, to be borne by the Board. Messrs. Ransomes and Co. have addressed a letter to the Clerk, dated March 28, comprising the above terms.

We further beg to direct the attention of the Board to the offer of the French Company to set up two additional dynamo-electric machines, and to light up twenty more lights on the Embankment, so carrying the electric lighting up to Blackfriars Bridge, the Company to charge 5d. per light per hour, inclusive of all current charges Perhaps the Board would authorize us to carry out this proposal.

The required authority was given.

LEAMINGTON NEW WATER-WORKS.

As briefly noted in the JOURNAL of the 18th ult., p. 406, these works were formally opened by the MAYOR (Mr. W. Harding), on Tuesday, March 11. The Borough Surveyor (Mr. G. B. Jerram, A. Inst. C.E.) supplies the following description of the works:—

The site of the well is situated on the north-east side of the town, at the foot of the Newbold Hills, about 214 feet above the level of the sea. There are two wells, one 7 ft. 6 in. inside diameter for a depth of 108 feet, lined to a depth of 90 ft. 6 in. with 14-inch brickwork; the remainder being lined with cast-iron cylinders formerly resting on a cast-iron plate at the bottom. At the bottom is a bore-hole, 20 inches in diameter, to a depth of 100 feet, and 12 inches in diameter for a further depth of 34 feet, making a total depth of 242 ft. 6 in. from the surface of the ground. The other, or main well, is 20 feet in diameter, and 112 ft. 6 in. in depth, lined with brickwork to a depth of 97 ft. 6 in., the remainder of the well being in rock. At the bottom is a bore-hole, 20 inches in diameter, to a depth of 100 feet, making a total depth from the surface of 212 ft. 6 in. The two wells are connected together by an adit 50 feet in length, 6 feet in height, and 4 feet wide; the mouth in the small well being protected by a sluice, which can be opened or shut from the top. The back of the brickwork of both wells is puddled, 2 feet in thickness, to a depth of 40 feet, to keep out surface water.

The permanent pumps are fixed in the large well. These consist of two pairs of 18-inch bucket and plunger pumps. The suction-pipes, which rest on stones at the bottom of the well, are made of copper, and at the bottom of each is fixed a grating to prevent any *débris* from choking the pumps. These are 14 ft. 6 in. in length, and are bolted to the permanent pump-barrels, which rest on cast-iron girders built into the sides of the well, firmly bedded on stone, and filled in behind with Portland cement concrete. These girders are also supported by massive cast-iron columns, resting on concrete foundation at the bottom of the well; 23 ft. 9 in. above the lower girders are built in other cast-iron girders, to which the pump-barrels are bolted. The two which support the air-vessel, sluice-valves, relief-valves, and rising main are made stronger, to carry the increased weight. The pump-barrels are made of cast iron, 1⅛ inch thick, and lined with gun metal ⅜-inch thick, tapering at the top and bottom; doors being provided so as to afford ready access to the valves. The suction and delivery valves are of the kind commonly known as double-beat Cornish. All the parts that are exposed to wear and the springs are made of gun metal, and are specimens of very good workmanship. The stroke of the pump is 5 feet. The connecting-rods between the bucket-valve and plunger are of wrought iron, 4 inches square, stiffened with pitch pine. The plungers are of cast iron, 1 foot in diameter and turned, 8 feet in length. The pump-barrels are extended upwards from the working barrel, 18 feet; on the top of which are placed the stuffing glands, lined with gun metal. To the plunger are fixed the pump-rods.

The pumps are connected with the air-vessel and rising main by cast-iron pipes, 13 inches inside diameter, having each a relief-valve, properly weighted, and a sluice-valve to open and shut from the top, double faced with two gun-metal faces, and gun-metal spindle and nuts. Owing to the

difficulty of fitting these four pipes to the air-vessel, it was necessary to provide special pipes, made similar to those used for expansion joints in steam-pipes. The air-vessel is of cast iron, of a capacity of 30 cubic feet, strongly fixed on to a sole plate, resting on the cast-iron girders before mentioned; and is fitted with gauge and pipe from the air-pump at top. The rising main in the well is 16 inches in diameter inside, made of cast-iron flanged pipes, 1¼-inch thick. At the bottom of the rising main is placed one of Thomas and Porter's patent retaining valves.

The water is conveyed from the top of the well by means of cast-iron pipes through a valve-chamber where sluices and branch pipes are placed so that the water may be turned either into the reservoirs, or on to the town direct, or down the sewers, care being taken to prevent any direct communication between the water-mains and the sewer by means of a brick trap, the sewer being ventilated direct into the chimney shaft. Thence the water is conveyed across the fields to the reservoirs by a cast-iron pipe, 16 inches in diameter, 1 inch thick for a length of 900 feet, and ⅞-inch thick for the remainder of the 1700 feet, the distance from the reservoir to the pumping-station.

In the well are seven stages made of elm plank, the approach to which is by means of wrought-iron ladders 2 feet wide, with galvanized rope for hand-rail. On the top stage is placed the gearing for moving the sluices to control the water from the pumps. Galvanized iron air-pipes are also carried up from the pump-barrels to the top stage, with suitable cocks.

The pumps are arranged in pairs, and worked by wrought-iron crank-shafts, laying across the top of the well. The pump-rods are of solid wrought iron, 4 inches in diameter, passing through guide-rollers on cast-iron girders, so made that the rods may be easily removed. The connecting-rods are of wrought iron, rectangular in section, bushed with gun metal at lower ends to receive cross-head pins, and filled with gun-metal bearings and wrought-iron straps, gibs, and cottars at the crank ends. Each pump crank-shaft has keyed on to it a cast-iron spur-wheel of 81 teeth, 4½ inches pitch, 12 inches wide on face. Between the pump crank-shaft is placed the pinion shaft, on which are mounted two cast-iron pinions adapted to slide on feathers, so as to be readily put into or out of gear, with the spur-wheels on the pump crank-shafts. The pinion-shaft is fitted with face-plate couplings at each end, which correspond to similar couplings on the outer ends of the engine-shafts. By these arrangements either engine may be coupled to the pinion-shaft, and made to drive either or both pairs of pumps, or, if required, both engines may be coupled to the pinion-shaft and made to drive either or both pairs of pumps. The gearing being arranged one to four, the engines make 40 revolutions per minute, when the pumps are working at their normal speed.

The engines are two in number, arranged one on each side of the engine-house, the well and gearing being between them. They are of the horizontal type, each having a single cylinder 21 inches in diameter, and 3 ft. 6 in. stroke. The valve-gear consists of a thorough ported main slide, with an expansion valve working on the back, the cut-off being adjusted by a variable link, the range of the cut-off being from about one-fifth to six-tenths of the stroke. The fly-wheels are 12 feet in diameter, and weigh each about 8 tons. The steam for the engines is produced in two Lancashire boilers, each 30 feet long by 7 feet in diameter, the flues of which are 2 ft. 8 in. in diameter, and are filled with Galloway tubes. The boilers are fitted with Adams's dead weight and Hopkinson's safety valves, and the usual mountings. They are intended to work at 60 lbs. pressure.

With three pumps working at nine strokes per minute, drawing and lifting 174 feet, the two engines indicate about 150-horse power, and the quantity of water raised is over 90,000 gallons per hour. It is only necessary to work the engine and one pair of pumps for a space of about seven hours daily to supply the daily consumption. The total quantity capable of being pumped to the reservoirs in 24 hours is 1½ million gallons per day. The total head on the pumps to the reservoir is 187 feet. The quantity of water is very considerable, and comes back to about the original height by the time pumping is required to be re-commenced.

In order to work the engines with greater economy, a large surface condensor, with air-pump, has been provided. This is placed in a chamber under the level of the engine-house floor, at the north-east corner of the engine-house. The cylinder is 6 ft. 9 in. long and 4 feet in diameter, having 460 brass tubes, ⅝-inch in diameter, having a total cooling surface of about 460 square feet. The circulation of cold water is obtained direct from the rising main in the well by a bye-pass 9 inches in diameter, provided with sluices, so as either to use the condenser or not, and to regulate the circulation. The exhaust steam is brought from the engines by 7-inch cast-iron pipes, with three double-seated equilibrium valves, and stop-valves, so as to work from either or no engine. The condensed water is pumped by the air-pump into pipes leading to the cistern in the boiler-house.

A tell-tale is provided to indicate the depth of water in the well; also pressure and vacuum gauges to show the pressure of water on the rising main and the vacuum in the condenser.

Over the large well and engines is erected the engine-house, 53 feet long by 37 feet wide, and lighted on three sides by Gothic-headed lancet windows, approached on the north by a doorway of an ornamental character, faced with Bath stone. There is a stone plinth round outside, the remainder of the building being in brick. The floor is flagged, except that portion over the condenser, which is of cast iron chequered plates. Adjoining the engine-house on the west side is the boiler-house, 47 ft. 3 in. long by 19 feet broad, with open roof, in which are a skylight and open louvres for the purpose of ventilation. The chimney shaft, which is square, is situated at the north-west corner of the boiler-house; it is 75 feet in height, and surmounted by an ornamental stone cap and iron finials.

Outside the engine-house on the north side is a subway, in which the rising main is laid, leading into a valve-chamber, 12 ft. 6 in. by 12 ft. 6 in., and 5 feet deep, built of brickwork in cement, covered over with cast-iron girders and chequered plates. The small well is also covered over in a similar manner. Near the engine-house on the south side is the cottage for engine-driver.

The whole is surrounded by a substantial wall, and the grounds are to be laid with grass and shrubs.

At the reservoirs there has been built a valve well, 12 feet in diameter, with stone bottom, into which the rising main empties. Pipes are laid into each reservoir, with sluices for turning the water into either reservoir. There is also a waste weir, to prevent the water overflowing; and an iron drain-pipe therefrom. An electric telegraph indicator has been erected between the reservoir and the engine-house, registering every variation of a foot rise or fall in the reservoir on a dial. This is believed to be the first of its kind, and has been worked out from the suggestion of the Engineer. The water is received into one or either of the covered reservoirs, each capable of holding 500,000 gallons of water. In order to lessen the inconvenience which might be caused by any temporary disarrangement of the machinery, duplicate bucket and plunger valves for each pump are provided; also, pipes for rising main, piston and piston-rod, tubes for condenser, &c.

The following is the description of the strata of the well and bore:—The well is 112 ft. 6 in. deep by 20 inches diameter. It was commenced on May 1, 1876, and completed, together with an adit 50 feet long, on May 1, 1877. The bore is 100 feet deep below the bottom of the well, the first 12 feet being 20 inches, and the remainder 18 inches in diameter. It was commenced March 16, 1877, and finished August, 1877.

Strata of the Well.

			Thickness.
Depth of filling to level of engine-house floor			6 ft. 6 in.
	Obtained May 25, 1876.		
Specimen No.	1.	Made ground	5 ft. 0 in.
,, ,,	2.	Red marl	11 0
,, ,,	3.	Grey sandstone	1 0
,, ,,	4.	Red marl	4 0
,, ,,	5.	Blue bind	4 6
,, ,,	6.	Brown sandstone	1 0
,, ,,	7.	Blue bind	2 6
,, ,,	8.	Red rock marl	3 0
			32 0
	Obtained July 17, 1876.		
Specimen No.	9.	Grey sandstone	3 6
,, ,,	10.	Marl and stone mixed	0 6
,, ,,	11.	Red marl	1 0
,, ,,	12.	White sandstone	1 6
,, ,,	13.	Soft white sandstone	2 6
,, ,,	14.	Hard blue bind	0 3
,, ,,	15.	White sandstone	5 0
,, ,,	16.	Blue bind	0 3
			14 6
	Obtained Sept. 15, 1876.		
Specimen No.	17.	White sandstone	2 6
,, ,,	18.	Blue bind	0 3
,, ,,	19.	White sandstone	6 0
,, ,,	20.	Blue bind	0 3
,, ,,	21.	Brown sandstone	5 0
,, ,,	22.	,, ,, rather softer	5 0
,, ,,	23.	Red marl	0 6
,, ,,	24.	Bluish sandstone	1 6
,, ,,	25.	Blue bind	0 3
,, ,,	26.	Brown sandstone	12 0
,, ,,	27.	Streaky hard blue bind	0 3
,, ,,	28.	Rag sandstone	4 0
,, ,,	29.	White sandstone	4 0
,, ,,	30.	Brown	2 0
,, ,,	31.	Raggy	1 0
			44 6
	Obtained Feb. 9, 1877.		
Specimen No.	32.	Grey rag sandstone	3 0
,, ,,	33.	White sandstone	8 0
,, ,,	34.	,, ,, rather darker	2 0
,, ,,	35.	Grey sandstone	2 0
			15 0
		Total depth of well	112 6

Strata of the Bore.

			Thickness.
Specimen No.	1.	White sandstone	4 ft. 0 in.
,, ,,	2.	Hard	6 0
,, ,,	3.	Hard	2 0
,, ,,	4.	White	4 0
,, ,,	5.	Hard white sandstone	3 0
,, ,,	6.	Soft red marl	1 0
,, ,,	7.	Hard marl with layers of sandstone	7 0
,, ,,	8.	Very hard reddish stone	10 0
,, ,,	9.	,, yellow stone	11 0
,, ,,	10.	Red marl	1 6
,, ,,	11.	Hard sandstone	6 0
,, ,,	12.	,, red marl	2 6
,, ,,	13.	Reddish sandstone	9 0
,, ,,	14.	Red marl	0 6
,, ,,	15.	Very hard stone	5 0
,, ,,	16.	Red marl	0 6
,, ,,	17.	Sandstone	3 0
,, ,,	18.	Soft red marl	4 0
,, ,,	19.	Red sandstone	10 6
,, ,,	20.	Red marl	0 4
,, ,,	21.	Sandstone	9 2
		Total depth of bore	100 0

THE ELECTRIC LIGHT IN THE UNITED STATES.

[From a New York Correspondent of *The Times*.]

The panic among the gas companies of New York City, and, indeed, among the American companies generally, in regard to the electric light, has nearly subsided. The panic was never very serious; but so many gentlemen went into the four or five Electric Lighting Companies last fall, and sold off their gas stocks so hastily, that in December there was for two or three weeks a falling off in market rates. A reaction set in, however, almost immediately, and shares have very nearly recovered from the shock they sustained in consequence of the supposed discoveries of Mr. Edison. The amount of capital invested in gas enterprise in this city and its suburbs of Brooklyn, Jersey City, and Harlem is a little over 40,000,000 dols. The following figures will show the effect produced by the announcement of Mr. Edison, in September last, that he had discovered a way to subdivide the electric light indefinitely, and the change which has occurred recently:—

Gas Companies.	Actual Selling Prices of Shares. Sept. 6, 1878.	Actual Selling Prices. Dec. 21, 1878.	Prices Bid and Asked, Feb. 28, 1879.
Brooklyn	150	118	135 — 140
Citizens*	75	52	67 — 72
Harlem	72	27	40 — 50
Jersey City	160	130	145 — 155
Manhattan†	195	148	176 — 180
Metropolitan†	132	98	115 — 125
Mutual†	75	54	72½ — 76
Nassau*	75	55	70 — 75
New York	95	78	95 — 100
People's*	32	20	20 — 30
Central†	85	55	70 — 80
Williamsburgh	85	75	75 — 85
Metropolitan*	62	50	60 — 65
Municipal†	95	80	115 — 125

The stock of the Harlem Company would have recovered more were it not that a competing company, the Knickerbocker, has recently been

* Brooklyn. † New York.

formed in that suburb, and will begin operations this summer by laying 100 miles of main-pipes. The stock of all the other companies is held firmly at the prices asked above. These quotations express very accurately the state of public feeling here in regard to the electric light. There is much scepticism about the likelihood of this new mode of illumination ever coming into general use in houses.

It is now known that Mr. Edison has failed in his experiments. The most that he has ever yet accomplished has been to maintain 400 coiled iron wires in a state of partial incandescence with a 16-horse power steam-engine. The object of this experiment was to ascertain the number of coils which could be brought to a red heat in any given circuit. It is upon this experiment that Mr. Edison based his claim that he could maintain 20,000 lights burning from one electrical station with a 600-horse power engine. The conclusion was a fallacious one, as Mr. Edison now knows. Platinum must be heated to 2700° before it attains the intensity of incandescence which is required for illumination, and when the metal is as hot as that, it is just on the verge of melting. To prevent the lamp from melting, this inventor has used a regulator, consisting of a bar of metal, through which the current flowed, which, when the current became too strong, expanded and switched off a part of the current, and thus saved the lamp. In practice this regulator has failed to perform the service required of it. When the current becomes strong, the platinum burner melts in the twinkling of an eye, and the mischief is done before the regulator can act. The inventor believed that he could overcome this practical difficulty, but he has not succeeded. His lamps have continually melted, and he has been unable to keep them from doing so, and the result is that there is great discouragement at Menlo Park. There has been another difficulty. Fourteen out of Edison's sixteen applications for a patent at the Washington Patent Office have been rejected. This impulsive man took up the electric light last fall as an entirely new subject of experiment, and allowed himself to believe that he saw a way to make the light useful which others had never thought of; but when he reached the Patent Office, he discovered that very nearly every idea which he had embodied in his applications had either been covered by the patents of other inventors, or was not patentable at all. This information was obtained from the Patent Office, and is one explanation of the discouragement which reigns at Menlo Park.

There is no doubt that the Edison light would be a delightful resource for the illumination of dwellings if it could be depended upon. It floods a room as though with golden sunlight—pure, brilliant, and mellow. But the inventor has never yet been able to regulate his current so as to keep his lamps burning for any length of time, and he has never ventured on a single public exhibition of it. The public have never seen so much as one of his lights yet. A favoured few who have been admitted to his laboratory at Menlo Park have beheld it—a single lamp, enclosed in a glass globe, beautiful as the light of the morning star. But he has refused to let any one inspect it closely, and has never allowed the exhibition of it privately to last long. He has never been able to depend upon its durability. His apparatus is as far from perfection as it ever was, and, in fact, well-informed electricians in New York do not now believe that Mr. Edison is even on the right line of experiment.

With reference to the Sawyer light, very little progress has been made with that invention either; but it may be said of that lamp that it has not yet proved a failure, and that it does still hold out some promise of success. Mr. Sawyer is endeavouring to perfect a plan for maintaining a slender crayon of carbon in a state of intense incandescence in a glass globe containing pure nitrogen. His light is extremely beautiful. It has about the power of five gas-burners, and can be turned up and down exactly as gas can be. The difficulties which he experiences are the getting rid of every trace of oxygen within his glass globes, and the rapid removal of the heat generated within the globe by the incandescent carbon. If the heat is not carried off in some manner, the temperature of the nitrogen rises so high that the glass globe is liable to crack in a draught of air or in cooling when the light is extinguished. The cracking of the glass may be dangerous to people in the room, and, if it is not, it permits the oxygen to enter, and away goes the carbon in ten minutes time. Mr. Sawyer's lamps have repeatedly burnt out owing to the entrance of oxygen through cracks in the glass. In order to obviate this trouble, a coil of very large wire, like a spiral spring, is introduced within the globe, being made to do duty as part of the conduit of the electrical current. This coil absorbs the heat from the nitrogen atmosphere, and conducts it rapidly to the large iron plate forming the base of the lamp, and radiates it into the open air. This arrangement answers very well. Mr. Sawyer made 50 lamps last December, intending to give a public exhibition of his light on New Year's Day. In order that the lamps might be comely, he made the glass globes as slender as the chimney of a German student's lamp. The coil to absorb and carry off the heat was necessarily made very small, and when the lamps were lit, it was found that the coils were too small to perform the service required of them. The glass globes became heated, and both the cracking of the glass and the melting of the wax at the base of the globes which made them air-tight followed. The whole of the 50 lamps had to be thrown aside, and the public exhibition was indefinitely postponed. Mr. Sawyer returned to a larger style of globe. He has now hit upon a size about 2½ inches or 3 inches in diameter, expanding into a bulb at the top, which is safe and practical. The removal of the oxygen has been more difficult to effect. A great many plans have been tried. The latest, and the one now in practice, is to obtain a vacuum by the aid of mercury, and to admit the nitrogen through the mercury, which is expelled from the globe by the entrance of the gas. Owing to some cause, there still remains a trace of oxygen within the globe. Where does it come from? This is the question which is puzzling Mr. Sawyer. He believes that the carbon itself contains enough atmospheric air to carry within itself the agency for its own destruction when subjected to the action of the electric current. His theory is that the oxygen, while combining with a minute quantity of the incandescent carbon to form carbonic acid gas, is always ready to leave the gas for the blazing carbon, its affinity for the latter being much more eager. Thus the slightest quantity of oxygen suffices to bring about the consumption of the carbon in time. In pure nitrogen his lamps ought to last for years, he thinks. The carbon crayon is scarcely longer than the lead of a Faber's pencil, but it cannot evaporate, and it will endure for a very long period of time if the oxygen is totally removed. At present his crayons last only a few weeks, burning only an hour or so every day. Could that point be mastered, and the oxygen totally expelled, Mr. Sawyer could introduce his lamp at once into extensive use, especially in hotels and similar large buildings. It would be in every way fit for private houses. There have been a large number of exhibitions of this light at the shops in the lower part of the city, where the experiments are in progress. The inventor is very frank in stating the obstacles he encounters, and he allows people to judge for themselves whether he is likely to succeed or not.

A third lamp for household use has been invented within the last year, and nearly perfected. One of the early friends and associates of Edison was a young man, named J. B. Fuller, a Connecticut Yankee, in whom the inventive faculty was active from boyhood. Fuller made a great deal of telegraph machinery, and invented many industrial processes—such as modes of utilizing wood pulp in paper-making, &c. Ten or fifteen years ago, Fuller separated from Edison, because it would no longer do to have them work in company. The inventions of the one might easily have been said to be due to the suggestions of the other, and so the two men parted, never to see each other again. They were men of very different qualities, Edison being quick to seize upon a new thought in natural science, and apply it to practical use long before any one else could see its practical value, while Fuller loved deep problems and research, and was much more gifted in the work of discovering new principles than in applying them. He was an eager student and a desperate worker, and he succeeded in mastering so many of the mathematical and other problems connected with electrical science, that he became the greatest authority thereon, particularly on magnetic induction, in this country. Fuller took up the subject of the electric light in 1874, and has been studying it, in an obscure laboratory in Brooklyn, until the present year. He found at the outset, like so many other men, that there was need of a good magneto-electric machine. He invented his own, based on the principle of Gramme's, and produced so powerful a one, that three years ago he succeeded in having it adopted by the Stock and Gold Telegraph Company of this city for practical telegraphy. The Company named has over a thousand machines in different parts of the city, upon which are printed every few minutes the quotations of stocks in Wall Street through the business hours of the day. The Fuller magneto-electric machine was adopted to operate the wire connecting with these stock and gold indicators. Fuller has studied ever since to improve his generator; but when he had once obtained a generator of reasonable power, he returned to experiments with a lamp. He shunned publicity, and in the obscurity of his little shop he toiled for years over his lamp. He was the man best fitted in the United States to attempt a solution of the problem. This inventor evolved a whole system of lighting—the generator, a lamp, and a meter. He proposed to use two large street mains, one of them insulated, disconnected at the outward ends. The positive main was to throw off a branch wire into each building to be lighted, the wire entering the meter, performing a certain service there, and then returning to the street to the negative main. The main current was not to do the lighting, but it was to generate another current in a series of induction coils, and each lamp was to be lighted by the current from one of these coils. An alternating current was to be used. The induction coils were thus made: Two magnet cores, arranged parallel to each other, were connected magnetically at the ends. Around the centres of each of these cores was a soft iron head, and at a proper distance from this a head of insulating material. The outward ends of the cores were coiled with insulated copper wire, and so connected together, and to the main wire (or generator), as to produce two opposite magnetic poles. Between the soft iron heads and the coils were wound smaller coils of insulated wire, the fineness of which would depend on the tension required. To one of the iron heads was hinged an iron arm, so made as to swing over upon the other, connecting magnetically the poles N and S. In a coil so made, if a current be sent through the main wire rapidly changing in opposite directions, the magnetic cores will change polarity, and the change will induce a current of great tension in the smaller coils, and this second current, if conducted by proper wires to a lamp, will maintain platinum or carbon in a high state of incandescence. Two induction coils, or four, can be coupled together for lights of stronger power. A graduated switch is used in this lamp, so as to permit its brightness to be varied at will. A great many experiments were made with this style of lamp with platinum burners, and they operated admirably. A number of capitalists of Brooklyn, hearing about these experiments, organized a company with one million dollars capital last December, to adopt Fuller's inventions, and introduce his light throughout Brooklyn. A new shop was fitted up for the inventor on Broadway, near Thirty-sixth Street, in New York City, near his residence, and in this shop Fuller toiled for six months almost literally day and night. His whole system was in a most promising shape, when last February an incident occurred which put a stop to the progress of experiments in household lighting.

The Company had determined to manufacture point-to-point lamps and magneto-electric machines first for factory use. About 20 factories in New England and the Eastern States have this winter introduced the large electric lamps of from 700 to 2000 candle power into their workrooms, and the demand for this means of lighting had suddenly become very active. The Fuller Company resolved, therefore, to solicit orders from factories, and it had 75 machines constructed, which are being finished up this week for factory use. During the first week of February Mr. Fuller was engaged in perfecting a new point-to-point lamp and began to be troubled with insomnia. Against the advice of his friends, he worked on his new lamp until it was finished. In the act of tightening up the last screw he fainted, and fell to the floor of his shop entirely exhausted, completely worn out with intense mental application and lack of sleep. He was carried to his residence. A week afterwards he had recovered so as to be active again. His busy mind had, in the meantime, discovered a new idea in induction. He sent over to the shop for his man George, the foreman of the works, to explain to him the new idea. The two men sat down together, and Mr. Fuller described his idea with much minuteness—the shape of the magnets, the size of the wire, the manner in which the wire was to be coiled on, and so on, motioning with his hands to illustrate his meaning. When Mr. Fuller had finished, he said, "George, do you understand that?" His foreman replied that he did. "Now," said Mr. Fuller, "I want you to understand that, George, for it is very important;" and then he went over the matter again, explaining the whole idea, with the mathematical principles involved in it. When he had completed the explanation the second time, he said, "Now, George, do you think you understand that?" The foreman said he did perfectly. Mr. Fuller looked pleased, lay back in his chair, and died soon afterwards. This was on the 15th of February. The inventor's life had flickered out, quietly, but unexpectedly to both men, and Mr. Fuller, as every one who is acquainted with his plans believes, has departed just at the moment when he was about to become famous and rich. His foreman was of too practical a turn of mind to see the poetic aspect of such an incident, and it is only within a day or two that the facts have been privately obtained by the writer.

The death of Mr. Fuller has retarded the perfection of his lamp for household lighting and may possibly postpone it for years. Very nice principles of induction are involved in the invention, and no one now living in America understands those principles so well as he did. The Company which he organized will not attempt to do anything about the household lamp for a long time. It will confine its attention to factory lighting. So that it can be said that, in spite of all the agitation which has arisen on this subject in the United States, this country is not a step nearer to the substitution of electricity for gas for general uses than it was a year ago. No perfect lamp has been found for the purpose, and none of the lamps invented are certainly known to be cheaper than gas. Edison admits that he is in doubt on the subject of cost himself. No other inventors in this country have been experimenting with household lights besides those above mentioned.

For factory lighting, the point-to-point lamps are coming into use very

fast. Twenty factories and hotels are now employing them. The Brush light is leading at present. The carbon rods in this lamp are covered thinly with copper to increase their conductivity; and 18 lamps of 2000-candle power each are kept burning on one circuit with 16-horse power, at a cost of 1·65 dol. per hour, and the interest and depreciation on an investment of 3750 dols. Brush is the only maker of lamps of this class who tries to operate several lamps with one machine. The others—the Fuller Company, Arnoux and Hochhausen, Wallace and Maxim—prefer to employ a single small machine with each lamp, believing that power is saved thereby.

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

With the exception that for house-fire coals there has been a very fair demand, owing to the severe weather of the last week or so, there is no very material change to notice in the coal trade of this district. All classes of round coals which are not being disposed of for house-fire purposes, are bad to sell, and extremely low prices are being taken to secure orders. There is not yet much doing in gas-making coals, but what little business is being done tends to confirm what I have said in previous reports, and there is every prospect that during the coming season buyers will be able to place their contracts on favourable terms. Common round coal for steam and forge purposes is still a drug, the requirements for iron-making and general manufacturing purposes being extremely small; whilst for shipment such low prices have generally to be accepted, that this class of business is anything but remunerative. Burgy only meets with a dull sale, owing to the depression in the cotton trade, and slack is still plentiful in the market; but although the common sorts are pushed at very low figures, holders of the better sorts are in some cases now showing a disposition to act here more firmly to their list rates. The average prices at the pit mouth may be given about as under:—Best Wigan Arley, 9s. to 9s. 6d., with the commoner sorts ranging from 6s. 6d. to 7s. 6d. per ton, and Pemberton four-feet about the same price; common round coal, 4s. 9d. to 5s. 6d.; burgy, 3s. 9d. to 4s. 6d.; and good slack, 3s. to 3s. 6d., with common sorts at 2s. per ton and upwards.

In the Manchester district reductions are being made at the close of this month of 5d. to 10d. per ton in the pit and wharf prices for round coal, and at the same time some reductions are also to be made in the wages of the men.

There is a continued absence of animation in the iron trade of this district, consumers still only buying from hand to mouth, and Lancashire makers of pig iron are selling very little, as they are so much undersold by some of the outside brands; Lincolnshire iron, particularly, being offered at prices which local producers cannot attempt to touch. In the finished iron trade there is also but little doing, and orders are keenly competed for at extremely low prices. For local irons delivered into Manchester, the quoted prices are about as under:—Pig iron, No. 3 foundry, 47s.; No. 4 forge, 46s. per ton, less 2½ per cent., but lower prices would be taken; bars, £5 10s. to £5 15s. per ton.

THE COAL AND GENERAL TRADE OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

There is every prospect that the wages dispute in the Durham gas coal trade will be arranged without a strike, which was at one time imminent. The weather in the North Sea was extremely stormy last week. Steamers were very backward, and the shipments of gas coals at the Tyne Dock were kept behind. There was plenty of unemployed steam tonnage in the river, and several boats were taken into trade at an advance of something like 6d. per ton freight. Business at the gas collieries has only been dull. Prices are low, especially for inferior coals. Some pits, which work second-class gas, steam, and manufacturing coals, are likely to close, as they do not pay.

The weather was intensely cold and inclement in the North last week. The continuous bad weather has had the effect of causing an increased demand for coals for domestic purposes. The coasting trade was, therefore, more active. Sailing ships to load coals for London were, for the first time in three or four weeks, in request, and about 5s. 3d. was paid to handy brigs to discharge gas coals at the wharves in the Pool. Sailing vessels were freighted to load gas coals for the Channel ports at a little stiffer rates than those quoted recently. Ready vessels have been rather scarce. The loading terms at the shipping places on the Tyne and Wear are immediate; there is no delay in that respect.

The manufacturing trades of these parts do not look so hopeful as they did a fortnight ago. Chemical business is not so firm. The demand for all the better qualities of fire-clay goods is stronger, though there may be no advance in prices. The shipments of this class of material to the Continent are fairly good. Iron has not sustained recent advances. The lead trade is very much stronger. Prices are advancing. Carthagena ordinary lead is sold at £14 17s. 6d. per ton. Rich lead has been disposed of at £15 a ton. The timber trade is flat and dull.

The gas share market in the North is remarkably steady. It was mentioned in conversation at the Tynemouth Gas Company's meeting on Tuesday last, that there had not been a transfer of stock for ten months in that Company. And it was stated that any little recession in the value of other gas shares which had occurred in the Northern district, consequent upon the electric light "scare," had been fully recovered.

TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

Owing, in a large measure, to the electric light scare and craze prevailing some months ago, and doubtless, also, in no mean degree, to the extraordinary trade depression which has existed in Scotland for some time, and more especially since the commencement of the series of great commercial disasters initiated by the failure of the City of Glasgow Bank, on the 2nd of October last, the movement for the adoption of the Burghs Gas Supply (Scotland) Act has been quite at a standstill. However, as the prognostications regarding the electric light have not been, and seem to be very far from being, realized, there has naturally been a reaction in favour of coal gas, and of confidence in its extensive use in the future, which will not unlikely be followed up, here and there, in small towns, by efforts on the part of the Municipal Authorities to take over the gas supply, in accordance with the provisions of the Anstruther Act. Still, it is just possible that the decision given by Dr. Anderson Kirkwood, in the Johnstone Arbitration case, may for a time act as a deterrent upon the Provosts, Bailies, and Town Clerk busybodies who have been proposing to themselves to follow the example set them by Alloa, Dumfries, Kirkintilloch, and other towns. In the meantime, all is quiet; no overt act being committed by any municipal authorities in the direction referred to.

By way of getting the gas consumers to take an additional amount of interest in the nature and properties and economic use of gas, Mr. Samuel Stewart, Corporation Gas-Works, Greenock, got up an interesting exhibition last week, in connection with a grand *conversazione* given by the Chief Magistrate of that enterprising town—Provost Lyle. He gave an instructive description of the working of gas-meters, wet and dry, a number of which he exhibited, explaining their construction and the method by which gas is measured; he also exhibited a variety of burners, arranged so as to show their economy in burning gas under proper regulation, and the waste of gas when it is burned without being properly controlled. The exhibition and demonstration likewise included the method of testing gas by jet tests, and by the use of the photometer. A number of Sugg's patent burners were also shown, amongst which there were two of the new Argands—a 200-light and a 50-light, lent for the occasion by Mr. D. M. Nelson, Mr. Sugg's agent in Glasgow. The electric light, as used in Messrs. Walker and Co.'s sugar refinery, was likewise brought into requisition, but it does not seem to have been a great success.

At a recent meeting, the Gas Committee of the Town Council of Glasgow resolved to award the sum of £410 in the shape of bonuses amongst the managers of the various works under their charge, in proportion to the success of the results severally obtained during the last financial year. They also gave orders for the purchase, from Messrs. Tangye Brothers, of Birmingham, of 300 more of Morton's patent self-sealing retort-lids.

A number of shares of the Montrose Gaslight Company were exposed for sale by public auction on Friday week, at the upset price of £51 10s. per share, at which figure most of them were disposed of.

On Monday, the 24th ult., the price of the Edinburgh Gas Company's shares declined 10s., and were quoted at £46 10s.; and on Wednesday there was another decline of the same amount, business being done at £46. Business was also done on the same day in Edinburgh Water Annuities at £149, and on the following day in Edinburgh and Leith Gas Company's stock at £33 10s. Glasgow Corporation Gas Annuities remain firm at £209, and £156 15s. for the 9 per cents. and 6¾ per cents. respectively.

There were exposed for sale by public auction on Thursday afternoon 44 shares of the capital stock of the Paisley Water Company, at the upset price of £16 per share. They were purchased at £16 3s. per share.

On Tuesday, the 25th of March, the contents of the seven reservoirs belonging to the Edinburgh and District Water Trust amounted to 2,401,955,000 gallons, as against 2,261,484,413 gallons on the 11th, and 636,430,349 gallons at the corresponding date of last year. The delivery of water into the city during the fortnight from the 11th to the 25th of March was at the rate of 11,386,337 gallons per day, equal to 38·92 gallons per head to a population of 292,500.

A joint meeting of the millowners and Municipal Authorities of Galashiels was held last Thursday evening, for the purpose of considering what steps should be taken in view of the threatened action of the riparian proprietors on the Tweed, in regard to the pollution of that river caused by discharges from the mills and by the town sewage. A long statement was made by Mr. J. Sanderson, on behalf of the manufacturers, who, in the circumstances in which they had been placed, and on receiving competent advice, had come to the conclusion that a joint scheme was the only one likely to prove satisfactory. That was also the opinion come to by the Corporation, and, towards receiving information on the subject, the Town Clerk was instructed to correspond with the Corporation officials of Bradford, Leeds, and other towns, to ascertain how far the drainage schemes in those towns had proved satisfactory.

The Glasgow pig iron warrant market was flat all last week, and receded steadily from day to day, closing dull on Friday at the lowest quotations, which were 7½d. per ton over those of the previous Friday, business being done at 42s. 9d. cash. The buoyancy of the past few weeks appears to be entirely lost, and a period of dulness is again setting in, so that the expectations of a satisfactory improvement are not for the present to be realized. Several makers have reduced their prices, but without inducing buyers. The demand is very dull for the lower priced brands, which are bought chiefly for storeing. Manufactured iron is without change.

Dulness still reigns in the coal markets, and buyers are very shy, in expectation it is thought of lower prices being quoted. House descriptions continued to be slow of sale. Some heavy lots have been purchased to be shipped shortly by the Canadian spring timber fleet sailing from the Clyde.

COMMENCEMENT OF THE NEW WORKS OF THE BRISTOL GAS COMPANY.—On Wednesday last the foundation-stone of the new works of the Bristol Gas Company was laid by the Chairman (Mr. F. Terrell). The works have been designed by Mr. Walter Fiddes, the Company's Engineer, and are to be carried out by Messrs. John Aird and Sons, of Lambeth. An account of the new works, and of the proceedings attending their inauguration, will appear in our next.

GAS EXPLOSION AT SCARBOROUGH.—An explosion of gas, though, fortunately, not of a very serious nature, occurred at St. Paul's Mission House, Regent Street, Scarborough, on the 24th ult. An escape of gas was noticed, and a man employed on the premises thoughtlessly took a lighted candle to find it out. This was immediately followed by a violent explosion, resulting in the displacement of a portion of the ceiling of the ground floor. None of the workmen engaged in the building received any injury.

LECTURE AT ANDOVER.—Mr. R. K. Moorhouse, the recently appointed Manager of the Andover Gas Works, last week read a paper before the local debating society, entitled "Gas Lighting *v.* Electric Lighting: Their Comparative Cost and Value." The paper went to show that the cost of the electric light as compared with gas is about seven times as great for an equivalent light, and that it is far more unsteady and uncertain. The paper, which lasted over half an hour, was attentively listened to; and at its close a conversation ensued as to the various methods of lighting, cost of gas, &c.

LIMERICK GAS COMPANY.—The half-yearly general meeting of the proprietors was held at the offices of the Company in London, on the 25th ult.—Mr. Hudson presiding. The report submitted stated that the operations of the Company had been satisfactory, and that the works and plant were in a very efficient condition. The total receipts, including the balance of undivided profit, amounted to £3130, from which the Directors recommended that a dividend at the rate of 3¾ per cent. on the Company's stock (£36,000) be declared, which would leave a balance of £1780 to be carried to next account. The report was adopted.

THE PURCHASE OF THE DERBY WATER-WORKS.—A special meeting of the Derby Town Council was held on Monday, the 24th ult.—the Mayor (W. J. Smith, Esq.) in the chair—for the purpose of affixing the seal of the Corporation to the definite agreement that had been drawn up for the purchase of the water-works. Alderman Longdon explained that the Council had already sanctioned, by their common seal, the draft of the heads of the agreement. Since then the matter had been considered by the Shareholders of the Water Company, who had done their part at the special meeting convened for the purpose. The definite agreement now submitted was based upon the heads of the agreement of which the Council had previously approved, and he moved that the common seal of the Corporation be affixed to it. Alderman Leech seconded the motion, and it was carried.

LEAMINGTON GAS COMPANY.—At the ordinary meeting of this Company, held on the 18th ult., the accounts showed total receipts of £19,262 18s. 3d., including a balance of £7539 carried forward from the previous half year, and £9646 14s. received for gas sold. On the other side, £3793 8s. 6d. had been paid for coal; £1031 3s. 6d. had been expended on repairs and

different works; £669 9s. 6d. was paid for salaries and Directors' fees, and £542 6s. 7d. was written off for depreciation. A dividend of 10 per cent. was declared on the old shares, with a bonus of 4s. per share, and a dividend of 7 per cent. on the new capital. The balance carried forward was £8144 19s. 6d. It was decided to shortly reduce the price of gas 3d. per 1000 feet in Leamington, and 6d. in the suburban districts. This will make the prices respectively 3s. 3d. and 3s. 9d. It was also decided to have an Argand light, like the lamp in Pall Mall, London, exhibited somewhere in the Kenilworth Road.

THE ROTHERHAM CORPORATION AND THE RAWMARSH LOCAL BOARD.—The arrangements between these two bodies, with reference to their application for parliamentary powers, have been finally settled. They are—that Rotherham is to supply Rawmarsh with gas in bulk at 2s. 3d. per 1000 feet for ten years, the gas to be delivered at Little Bridge; the Local Board to buy the mains in their district at a price to be agreed upon by the Engineers of the Corporation and the Local Board; the Local Board to supply gas and water to the part added to Greasborough, and to have the power to erect gas-works at the end of nine years, but not to use them until the expiration of ten years. The Rotherham Corporation to exclude the Rawmarsh sewage works from their Bill, and to buy the water-mains belonging to the Local Board in that part of Greasborough which is to be added to Rotherham, and to remove the present water-meter and meter-house to Little Bridge, at the expense of the Corporation.

TORQUAY GAS COMPANY.—The annual meeting of this Company was held on the 24th ult.—Mr. W. Kitson in the chair. The report presented stated that, inclusive of the balance brought forward from last year, there was a sum of £6042 available for distribution, and the Directors recommended that the usual dividends of 10 and 7 per cent. should be paid out of that sum. This would absorb about £3500. On the capital account there was a sum of £952 13s. 10d. due from the Company; and to meet this and other expenditure which must shortly be incurred in extension of works and mains, &c., the Directors had given notice of their intention to offer for sale by auction 300 £10 shares, which would bear dividend not exceeding 7 per cent. The Chairman briefly referred to the accounts and moved—"That the accounts of the Company for the three-quarters of a year ending Christmas last, as examined and certified by the Auditor, showing a balance due to the Treasurer on the capital account of £952 13s. 10d., and from the Treasurer on the revenue account of £1643 9s. 4d., be received; and that the recommendation of the Directors with respect to the dividend to be declared be adopted." The resolution was unanimously adopted. Mr. W. Kitson was re-elected a director. Colonel Turnbull was substituted for Mr. Skinner, who retired from the directorate; and Messrs. Dymond and Rowe were chosen as Auditors. An addition was made to the salary of the Secretary (Mr. J. Kitson), and a vote of thanks was passed to the Chairman and retiring Director.

VISIT OF THE MANCHESTER GAS COMMITTEE TO THE MAIDSTONE GAS-WORKS.—On Thursday, the 20th ult., the Deputy-Chairman and several members of the Gas Committee of the Manchester Corporation paid a visit to Maidstone, with a view of inspecting the system of drawing and charging retorts, which has recently been adopted at the works of the Maidstone Gas Company. Mr. G. B. Jackson, Superintendent and Manager of the Manchester Corporation Gas-Works, accompanied the deputation, who were met by the Chairman of the Maidstone Gas Company (Mr. Ambrose Warde), Messrs. G. Edmett, and S. Bentlif (Directors), the Mayor of Maidstone (Mr. C. Ellis, J.P.), and Mr. J. West (the Company's Engineer). The Committee were very cordially received, and conducted to the new retort-house, where Mr. West's system of drawing and charging the retorts was inspected. This system has now been in operation at the Maidstone Company's works for several months past, and is found to work very satisfactorily. Prior to the inspection, Mr. West detailed the advantages claimed for his invention, and referred to the saving of labour and expense resulting from its adoption. The subsequent drawing and charging of the retorts was keenly watched, and the ease and expedition with which the operation is conducted was a subject of remark. The Manchester visitors afterwards inspected the new exhauster, engine-house, and purifiers, and other interesting portions of the Company's premises, and appeared highly gratified with their visit to the works, which, for a town of moderate size, they considered approached perfection, and very high encomiums upon Mr. West's system were passed.

TYNEMOUTH GAS COMPANY.—The annual general meeting of the Tynemouth Gas Company was held at North Shields, on Tuesday, the 25th ult. —Mr. Geo. Williamson in the chair. The report of the Directors was submitted by the Secretary (Mr. W. H. Atkinson). The balance and profit and loss account showed a balance of profit of £5959 16s. 11d. on the year. The Directors recommended the payment of the statutory dividend of 10 per cent. on the ordinary stock, and 7 per cent. on the £10 shares, which would amount to £5069 12s. 10d., and leave a balance of £890 4s. 1d. The Chairman, in moving the adoption of the report, stated that the works were in a highly efficient condition, and that everything was going on in a most satisfactory manner. The late electric light "scare" had not affected the Shareholders of the Tynemouth Company, and he hoped they would be very careful before they parted with property so valuable as their shares were. The report was unanimously adopted, and the dividends were declared. The recommendation of the Directors, that the balance of profit which had been left over after paying the dividends of 1877 and 1878, and a portion of the balance of this year, in all amounting to £1718 3s. 6d., be added to the reserve-fund, making the same £2500, and leaving £277 11s. 4d. remaining to the credit of profit and loss account, was also agreed to. Mr. Thos. Crow and Mr. George Williamson were re-elected Directors, and Mr. John Richardson one of the Auditors. Hearty votes of thanks were accorded to Mr. W. H. Atkinson, the Secretary, who had held that office over a period of 30 years—since the commencement of the Company, indeed—and to the Chairman and Directors. The Chairman and Secretary made suitable replies. The Directors have made a call of £2 per share on the last allotment of £10 shares to meet the cost of extensions of mains, &c.

GAS-WELLS IN OHIO.—The gas-wells of East Liverpool, Ohio, it is said, furnish a continual supply of light and heat to the town, and as the gas costs nothing, the street-lamps are never extinguished. It is used almost exclusively for fuel, being conducted into the grates and stoves by pipes. For 20 years this has been going on, and there are no indications that the supply of gas is giving out.—*Scientific American.*

BLAENAVON GAS AND WATER COMPANY, LIMITED.—The annual meeting of this Company was held on Thursday, Feb. 27—Mr. David Lewis presiding. The following was the report:—"In presenting to the Shareholders the annexed statement of accounts for the year ending Dec. 31, 1878, your Directors have pleasure in stating that, notwithstanding the general depression of trade in this district, and other adverse circumstances, during the past year, they believe the results generally will be considered satisfactory. A mortgage of £500 has been obtained (as a temporary loan), and expended in replacing the old purifiers and meter, which were much too small for the work to be done, and erecting an engine and exhauster, with the necessary alterations of buildings, &c., thus placing the manufacturing plant in a thoroughly efficient condition. Referring to the amount—£308 11s. 10d.—for tank repairs, which has been paid out of revenue, it is hoped that the measures taken will render any further expenditure for this purpose unnecessary. The price of gas has been reduced 3d. per 1000 cubic feet from Jan. 1, 1879, and your Directors trust that this will lead to an increased consumption. The balance of profit, as per revenue account, enables the Directors to recommend a dividend of 6 per cent. per annum, free of income-tax." The report was agreed to, the dividend declared, and the retiring Directors and Auditor were re-elected. Votes of thanks were then passed to the Chairman, Directors, Manager (Mr. C. White), and Secretary (Mr. A. J. Clark), which, being responded to by the Chairman, on behalf of the Directors and himself, Mr. White tendered his acknowledgment to the meeting for the compliment paid him. He said he prized the vote highly, coming, as it did, from gentlemen who were intimately acquainted with the duties he had to perform, and the manner in which they were carried out. With regard to the electric light, he thought he could not say much that would be of interest, as the subject had of late been so thoroughly ventilated. However, he was pleased to find that the opinion expressed by him on returning from Paris, that gas companies had but little to fear from the competition of electricity, was now more generally accepted. After a lengthy description of the apparatus employed in the production of the electric light, and a comparison of its effects with the convenient and agreeable light afforded by gas, he concluded by again thanking the meeting for their hearty expression of approbation, and trusted that the longer he was connected with the Company, the more he might succeed in earning the good wishes of all concerned. Mr. Clark having, in a few well-chosen remarks, thanked the meeting for the compliment paid him, the proceedings terminated.

Share List of Gas and Water Companies.

(Corrected by Mr. F. N. GOLDING, 23, Cornhill, from the latest Stock Exchange Quotations.)

Number of Shares issued.	Amount per Share.	Name.	Amount paid up per Share.	Last Divd. p.Cent. p. Ann.	Latest Quotations.	Number of Shares issued.	Amount per Share.	Name.	Amount paid up per Share.	Last Divd. p.Cent. p. Ann.	Latest Quotations.	Number of Shares issued.	Amount per Share.	Name.	Amount paid up per Share.	Last Divd. p.Cent. p. Ann.	Latest Quotations.
£	£	GAS COMPANIES.	£ s. d	£ s. d	£		£	GAS COMPANIES.	£ s. d	£ s. d	£		£	GAS COMPANIES.	£ s. d	£ s. d	£
589862	10	Alliance and Dublin	10 0 0	10 0 0	16—17	6200	5	Georgetown, Guiana	5 0 0	7 0 0	..	12500	5	Singapore (Limited)	5 0 0	7 10 0	5¼—5⅞
10000	20	Anglo-Romano . .	20 0 0	10 0 0	21—23	300000	100	Glasgow Corporation Gas	100 0 0	9 0 0	205—210	2000	5	Do., preference .	5 0 0	7 10 0	5⅞—6¼
5000	20	Bahia (Limited). .	20 0 0	3 0 0	12—13							4000	50	South Metropolitan	50 0 0	11 10 0	97—102
1500	20	Do., 2nd pref. . .	20 0 0	7 10 0	20—22	115000	100	Do., do.	100 0 0	6 15 0	155—160	4000	12½	Do.	12 10 0	11 17 0	24—26
40000	5	Bombay (Limited).	5 0 0	7 10 0	5½—6	..	100	Grimsby Gas, A . .	100 0 0	..	186—190	20000	12½	Do., new shares .	12 10 0	11 10 0	24—26
10000	5	Do., fourth issue.	4 0 0	7 0 0	½—1 pm.	..	10	Hampton Court . .	10 0 0	10 0 0	14—15						pm.
5000	20	Bournemouth . . .	10 0 0	7 0 0	..	7000	10	Hong Kong (Lim.)	10 0 0	10 0 0	14—16	15000	10	Surrey Consumers.	10 0 0	10 0 0	17—18
229700	..	Brentford	100 0 0	9 0 0	145—150	5000	10	Hornsey	10 0 0	10 0 0	13—14	10000	10	Do., new	8 0 0	10 0 0	6—7 pm.
..	..	Do., 5 per ct. pref.	100 0 0	5 0 0	93—96	2000000	50	Imperl. Continental	100 0 0	5l. p.sh.	170—173	..	5	Tottenham and Edmonton	5 0 0	10 0 0	7⅛—8⅛
..	20	Do., C shares . .	16 0 0	9 0 0	7—8 pm.						xd.						
5400	20	Brighton	20 0 0	10 0 0	31—33	..	..	Kingston	..	..	..	1500	10	Wandsw. & Putney	10 0 0	10 0 0	14½—15
5000	20	Brighton and Hove	20 0 0	10 0 0	32—34	..	..	Lea Bridge	..	..	11¼—12⅛	1500	10	Do.	10 0 0	7 10 0	10¼—11½
14000	20	British (Limited) .	20 0 0	10 0 0	34—35	9000	4	Limerick Gas . . .	4 0 0	3 15 0	2—2⅛	4000	10	Do.	10 0 0	7 0 0	..
7223	20	Cagliari (Limited).	20 0 0	7 0 0	16—18	561001.	100	Liverpool United .	100 0 0	..	180—185	26000	5	West Ham	5 0 0	10 0 0	8—9
1500	10	Colney Hatch . . .	10 0 0	5 0 0	8—9	1691001.	100	Do., B	100 0 0	7 0 0	125—135	..	..	West Kent	..	..	13—14
55000l.	Sk.	Commercial	100 0 0	10 0 0	180—185	3865001.	Sk.	London	100 0 0	10 0 0	175—180	..	..	Woolwich, Plmstd., and Charlton . .	..	10 15 0	..
70000l.	Sk.	Do., 7 per cent. .	100 0 0	7 10 0	115—125	1500001.	Sk.	Do., 1st pref. . .	100 0 0	6 0 0	122—125						
20000	20	Continental Union.	20 0 0	6 10 0	17—18	8550	Sk.	Do., 2nd pref. . .	100 0 0	6 0 0	100—106						
22000	20	Do., new	14 0 0	6 10 0	3—2 dis.	7622	25	Do., A shares . .	25 0 0	6 0 0	29—31						
10000	20	Do., preference .	20 0 0	7 0 0	21½—22½	266921.	Sk.	Do., Debent. stk.	100 0 0	5l. & 6l.	..						
75000l.	Sk.	Crystal Palace Dist.	100 0 0	10 0 0	165—170	15000	5	Malta and Mediterranean (Limited).	5 0 0	2 10 0	1⅞—2¼	615600	100	WATER COMPANIES. Chelsea	100 0 0	6 0 0	150—153
125000l.	Sk.	Do., 7 per cent. .	100 0 0	7 0 0	117—122												
50000l.	Sk.	Do., preference .	100 0 0	6 0 0	115—120	6000	5	Do., preference .	5 0 0	7 10 0	5—6	1624700	100	East London . . .	100 0 0	6 0 0	151—155
25000	6	Do., ord. 7 p. c. .	1 4 0	7 0 0	¼—1 pm.	20000	5	Mauritius (Limited)	2 5 0	3 6 8	1⅞—1¾ dis	10798	50	Grand Junction . .	50 0 0	5 0 0	81—85
7160	25	Edinburgh	25 0 0	10 0 0	46—48	27096	20	Monte Video (Lim.)	20 0 0	8 0 0	13½—14½	5840	25	Do., ½ shares . .	25 0 0	5 0 0	41—43
23405	10	European (Limited)	10 0 0	10 0 0	15¼—16¼	8000	10	Nictheroy, Braz. (L.)	10 0 0	5 0 0	3—4	6160	25	Do., new ditto; max. div., 7½ p.c.	25 0 0	5 0 0	35—37
12000	10	Do., new shares .	7 10 0	10 0 0	3¼—4¼pm	30000	5	Oriental (Calcutta).	5 0 0	9 0 0	6¼—7⅛						
35406	10	Do., new shares .	5 0 0	10 0 0	2¼—3¼pm	30000	5	Do., new shares .	3 10 0	9 0 0	1—2 pm.	5551801.	100	Kent	100 0 0	8 0 0	207—215
4096300l.	Sk.	Gaslight & Coke A.	100 0 0	10 10 0	173—176	10000	5	Ottoman (Limited).	5 0 0	3 0 0	2—2½	7818001.	100	Lambeth	100 0 0	6 5 0	150—153
1000001.	Sk.	Do. B.	100 0 0	4 0 0	74—77	10000	10	Pará (Limited) . .	10 0 0	3 0 0	4½—5½	3261501.	100	Do., max., 7½ p.c.	100 0 0	6 5 0	143—148
50000	10	Do. 5 per ct. pref. conv., 4th issue.	10 0 0	5 0 0	16—17	27000	20	Phœnix	20 0 0	10 0 0	35—37	442	100	New River	100 0 0	7 0 0	320—330
						3600001.	100	Do., new max. 7½	80 0 0	7 10 0	103—105	4475	100	Do.	100 0 0	7 0 0	280—300
50000	10	Do. do., 5th do. .	10 0 0	5 0 0	15—16	1440001.	Sk.	Do., capitalized .	100 0 0	5 0 0	95—100	400000	100	Do., deb. sk., 4 p.c.	100 0 0	4 0 0	101—103
2000001.	Sk.	Do. C 10 p.c. pref.	100 0 0	10 0 0	200—205		20	Do., new, 1876. .	16 0 0	10 0 0	13—15pm	6668001.	100	Southwrk. & Vauxh.	100 0 0	4 0 0	112—114
3800001.	,,	Do. D do. do. .	100 0 0	10 0 0	200—203	..	..	Richmond (Surrey)	..	..	15—16	3247001.	100	Do., pref. stock .	100 0 0	5 0 0	113—116
1650001.	,,	Do. E do. do. .	100 0 0	10 0 0	200—203	37500	20	Rio de Janeiro (L.)	20 0 0	10 0 0	25—27	1265001.	100	Do., D shares . .	100 0 0	4 0 0	110—112
300001.	,,	Do. F 5 do. do. .	100 0 0	5 0 0	100—103	1500	32½	Shanghai	32 10 0	12 0 0	..	700001.	100	Do., new ordinary	..	4 10 0	..
60001.	,,	Do. G 7½ do. do. .	100 0 0	7 10 0	145—158	..	100	Sheffield, A . . .	100 0 0	10 0 0	192—194	1600	100	Do., new ord. No. 1	40 0 0	4 10 0	..
1800000l.	,,	Do. H	100 0 0	7 0 0	125—130	..	100	Do., C	100 0 0	10 0 0	106—108	15073	61	West Middlesex . .	61 0 0	6l. p.sh.	149—142

APPLICATIONS FOR LETTERS PATENT.

1122.—Fox, St. G. L., Telegraph Street, London, "Improvements in the means or apparatus for obtaining light by electricity, and in the manufacture of materials to be employed therein." March 20, 1879.
1160.—Wigham, J. R., Monkstown, Ireland, "Improvements in illuminating lighthouses and other places." March 24, 1879.
1175.—Imray, J., Southampton Buildings, London, "Improvements in electric candles." A communication. March 24, 1879.
1184.—Brewster, R., Golden Square, London, "Improvements in or applicable to apparatus for regulating the supply or conduit of gas or liquid fuel for heating purposes by the action of steam-pressure gauge." March 25, 1879.
1188.—Dufrené, H. A., Paris, "An improved meter or apparatus for measuring water and other liquids.' A communication. March 25, 1879.
1204.—Rowley, G., and Smith, E., Birmingham, "A new or improved self-generating gas-burner." March 26, 1879.
1207.—Dillon, T. A., Dublin, "An improved method of and apparatus for producing electric lights, whereby such light can be more conveniently distributed, and economically maintained, in public places and private houses." March 26, 1879.
1208.—Royle, J. J., Manchester, "A new or improved appliance for connecting tubes or pipes to taps or valves of water supplies, also suitable as a union, and for making other connections to water-pipes." March 26, 1879.

PATENTS WHICH HAVE PASSED THE GREAT SEAL.

3853.—Wilkinson, A., Marylebone, and Wellings, W., Harrow-on-the-Hill, London, "Improved means of and material for lighting and heating (especially applicable to railway carriages and other portable conveyances), and burners for the same." Sept. 30, 1878.
3937.—Lake, W. R., Southampton Buildings, London, "Improvements in gaslight extinguishers." A communication. Oct. 7, 1878.
4031.—Clark, A. M., Chancery Lane, London, "Improved means of softening or diffusing the electric and other light." A communication. Oct. 11, 1878.
4047.—Harding, G. P., Paris, "Improvements in apparatus for regulating electric light." Oct. 12, 1878.
5234.—Lawson, J. S., Barnsley, Yorks, "Improvements in the construction of gas-stoves." Dec. 21, 1878.

PATENTS WHICH HAVE BECOME VOID

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £50 BEFORE THE EXPIRATION OF THE THIRD YEAR.

983.—Lake, W. R., "Improvements in gaseliers." March 7, 1876.
1013.—Caldwell, A., "A new or improved apparatus for controlling or regulating the flow of water or liquids in dwelling-houses, factories, and other buildings, the same being applicable as a water or liquid meter." March 9, 1876.

The GRAND MEDAL of MERIT at the VIENNA EXHIBITION, TWO MEDALS at the PHILADELPHIA EXHIBITION and TWO MEDALS at the PARIS EXHIBITION, have been AWARDED to GWYNNE & CO. for GAS-EXHAUSTERS, ENGINES, and PUMPS; Also 27 OTHER MEDALS AWARDED at all the GREAT INTERNATIONAL EXHIBITIONS.

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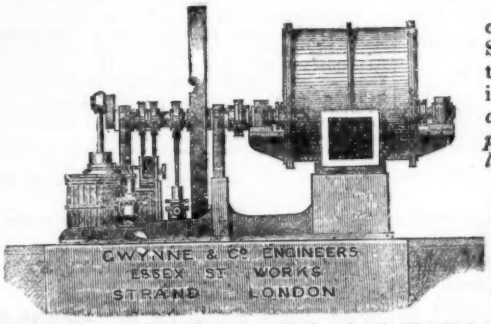
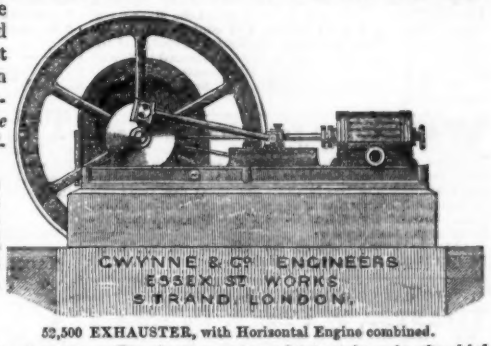


EXHAUSTER with Trunk Engine, capable of passing 210,000 cubic feet per hour.

The Judges report on the combined Exhauster and Steam-Engine exhibited at the Philadelphia Exhibition is—"*Reliable compact Machine, well adapted for the purpose intended, of excellent workmanship.*"

GWYNNE & CO. have made the largest and most perfect Gas-Exhausting Machinery in the world, and have completed Exhausters to the extent of 8,000,000 cubic feet passed per hour, of all sizes from 2000 to 210,000 cubic feet per hour.



52,500 EXHAUSTER, with Horisontal Engine combined.

GWYNNE & CO. do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, *but to produce machinery of the very highest quality, and most approved design and workmanship.* The result is that in every instance their work is giving the fullest satisfaction. Numerous testimonials and references can be given to Companies using their Machinery for years past.

Exhausters, with or without Engines combined, can be made to pass the gas WITHOUT OSCILLATION OR VARIATION IN PRESSURE Regulators, Bye-Passes, Stop-Valves, Gas-Valves, Station Governors, and Gas Machinery of all Sizes.

PLEASE ADDRESS IN FULL, GWYNNE & CO., Hydraulic and Gas Engineers, ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C., ENGLAND.

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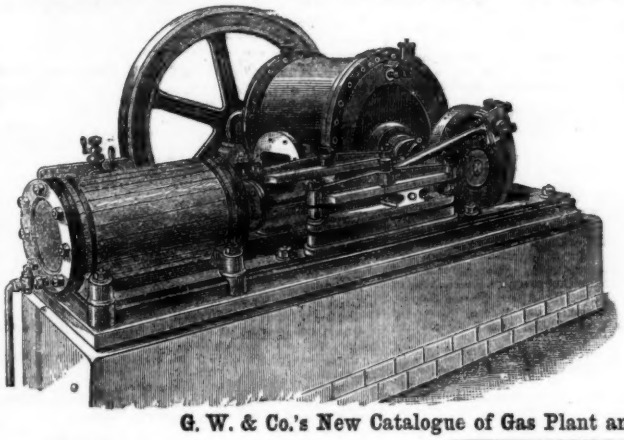

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MAKERS OF ENGINES, EXHAUSTERS, INDEX AND DISC GAS-VALVES, HYDRAULIC MAIN VALVES, BYE-PASS VALVES, TAR, LIQUOR, AND OTHER PUMPS, SCRUBBERS AND PURIFIERS, CONDENSERS, BOILERS, &c.

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Beg to call the attention of Gas Engineers to the fact that the novel and original feature in connection with PEEBLES' SYSTEM OF CONTROLLING THE ACTION OF GAS GOVERNORS is the loading or acting on the Bell by Pneumatic Pressure instead of Weights.

TAY WORKS, BONNINGTON, EDINBURGH.

WANTED, Readers of the NEW Edition, 1879, "Cooking & Heating by Gas;" on Burners, &c. Copies, by post, Threepence, direct from the Author, MAGNUS OHREN, A.I.C.E., Gas-Works, SYDENHAM, S.E.

WANTED, for the Faringdon Gas-Works, a YARD FOREMAN. Wages 24s. per week, cottage and garden free. Must be a competent Fitter. Good character indispensable.
Apply, in own writing, to E. BURRELL, Faringdon, BERKS.

TO GAS COMPANIES.

WANTED to Purchase, One Length of Hydraulic MAIN-PIPE, from 5 to 7 ft. long, D-shape, to attach to another 18 in. by 18 in. (including two inches of flange all round). Inside measure, 14 inches.
State price to Gas Company, LEDBURY.

WANTED, in a small Gas-Works, Two Sober Men as STOKERS. Good wages given. Constant employment. Also a FITTER who has been used to Retort-House work. One who can do a little Smithing preferred.
Address No. 536, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, on the 11th of April, for a small Gas-Works at Waterbeach, Cambs, a Working MANAGER. Must understand Iron and Clay Retorts, Main Laying, Meter Fixing, &c. Wages £1 per week, together with good house and garden, fuel and light.
Apply to the SECRETARY, Gas Company, Waterbeach, CAMBS.

WANTED, by a respectable Young Man, aged 27, an Appointment as METER INSPECTOR, COLLECTOR, or to assist the Manager of Gas-Works. Is a good writer, and could assist in the office work. Has a thorough practical knowledge of the Gas-Fitting Department, and is also experienced in Superintending Workmen. Excellent testimonials.
Address No. 538, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by a Young Man (married), a Situation as MANAGER, or Secretary and Manager, of a small Gas-Works, or Assistant in a larger one. Has had considerable experience in the Manufacture and Distribution of Gas in all its branches; five years sole Manager. No objection to any place in the United Kingdom. Satisfactory reasons for change. Unexceptional references and testimonials.
Address, in first instance, No. 526, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TO GAS COMPANIES AND ENGINEERS.

WANTED, by a man in the prime of life, who has had many years practical experience in the Erection and Management of Gas-Works, and who has recently returned from a foreign engagement, a Situation in a like capacity, either at home or abroad. Unexceptionable testimonials, and security to any reasonable amount for the due performance of all duties in connection with the office. If deemed advisable, would take an interest in any Gas Undertaking, by investing capital in same.
Address, in the first instance, No. 537, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

SHREWSBURY GAS COMPANY.

WANTED immediately, a Manager and Secretary, thoroughly acquainted with the Engineering in connection with the Manufacture and Distribution of Gas, upon the most approved principles, also the general routine of office work. Salary, £300 per annum.
The person selected must give security in the sum of £500, and devote the whole of his time to the service of the Company.
Personal canvassing not allowed.
Applications, stating whether married or single, age, and experience, accompanied by testimonials of recent date, not exceeding four in number, to be forwarded to me, on or before the 3rd of April next, endorsed, "Application for Manager." By order,
S. B. DARWIN, Secretary and Manager.
March 6, 1879.

THE Proprietors of a large Gas Engi- neering Establishment in the North have an Opening for an Intelligent Youth as Pupil. Professional Engineering and every branch of Contracting is undertaken. A Premium required.
Address No. 539, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

AGENCY AND OFFICES.

A GENTLEMAN, of 25 years business experience, having good Offices in the City, is open to REPRESENT any Firm in the Iron or Hardware Trade, or Makers of Gas Machinery requiring an Agent in London, or a London address.
Address P. Q., care of J. W. Vickers, General Advertizing Offices, 5, Nicholas Lane, LONDON, E.C.

FOR SALE, Cheap, A Telescope Gas- holder, 40 ft. in diameter, in Two Lifts, 17 ft. each, with a Cast-Iron Tank suitable for the same; also a 200-Light Gas Apparatus, by Porter, of Lincoln.
Apply to ROBINSON BROTHERS, Managers, Gas-Works, COVENTRY.

CORPORATION OF BIRMINGHAM. GAS DEPARTMENT.

TO COLLIERY PROPRIETORS AND OTHERS.

THE Gas Committee will shortly be pre- pared to receive TENDERS for the Supply of GAS COAL to their Works at Birmingham and Swan Village (Great Western Railway), for the year beginning July 1, 1879.
Applications for permission to submit samples of the Coal proposed to be offered may be addressed to the Engineers, Mr. Charles Hunt, Windsor Street Gas-Works, and Mr. Henry Hack, Saltley Gas-Works, Birmingham.
EDWIN SMITH, Secretary.
Old Square, Birmingham, March 31, 1879.

TO BE SOLD, Cheap, Three Telescopic GASHOLDERS, two 60 ft. diameter and 20 ft. deep each lift, and one 70 ft. in diameter and 20 ft. deep. Only been in use eight years. May now be seen at work at the Effingham Street Gas-Works, Sheffield.
For price, apply to THOMAS PIGGOTT AND CO., Spring Hill, BIRMINGHAM.

GAS PLANT.

THE Corporation of Richmond (Yorks) have for disposal a quantity of modern-made GAS PLANT, consisting of Hydraulic Main for 10 Retorts, with Ascension-Pipes, Mouthpieces, Bridge and Dip Pipes, Set of Condensing Pipes, two Washers, Set of four Purifiers. The above are in good order, having been recently replaced by larger plant.
For further information, apply to J. MEIKLEJOHN, Manager.

THE Penrith Local Board of Health have FOR SALE the following Second-hand PLANT:—
One Station-Meter, 5000 cubic feet per hour, with 7-in. Connections.
One Condenser, thirty 7-in. pipes, 14 ft. high, with four boxes.
Four Purifiers, 10 ft. by 6 ft. by 4 ft., with Centre Valve.
For further information, apply to Mr. J. HEPWORTH, Gas-Works, CARLISLE.

TO PIPE FOUNDERS AND OTHERS.

THE Southwark and Vauxhall Water Company, by their Directors, invite TENDERS for Cast-Iron SOCKET-PIPES and other special Castings.
Specifications and form of tender, and other particulars, can be obtained at the Office of their Chief Engineer, upon payment of 31s. 6d., and the said tender must be forwarded not later than April 7 next, addressed to the Chairman, Southwark and Vauxhall Water Company, Sumner Street, S.E., endorsed, "Tender for Pipes."
By order.

NEWPORT (MON.) GAS COMPANY.

TO TAR DISTILLERS.

THE Directors of the Newport (Mon.) Gas Company are prepared to receive TENDERS for the Purchase of the Surplus TAR produced at their Works for a period of One year.
Sealed and endorsed tenders to be sent in not later than the 2nd of April next.
By order of the Directors,
EDWARD F. MARFLEET, Secretary.
Gas Offices, Newport (Mon.), March 21, 1879.

MACCLESFIELD CORPORATION GAS-WORKS.

TO TAR DISTILLERS AND OTHERS.

THE Gas Committee are prepared to receive TENDERS for the Purchase of the Surplus TAR and AMMONIACAL LIQUOR made at their Works during the Twelve months commencing on the 1st day of May ensuing.
Tenders to be sent in not later than the 12th of April, addressed to the Chairman, Gas Committee, Town Hall, Macclesfield, and endorsed "Tender for Tar," &c.
For conditions of contract, apply to
THOMAS MOORE, Manager.
Gas-Works, March 24, 1879.

TO IRONFOUNDERS.

THE Sevenoaks Gas Company are pre- pared to receive TENDERS for the Supply of the undermentioned SOCKET-PIPES. To be delivered free at the Bat and Ball Station of the London, Chatham, and Dover Railway, Sevenoaks.

About 700 yards 12-in. pipes, 12* ft. lengths.
„ 1000 „ 10 „ 9 „
„ 650 „ 6 „ 9 „

* A portion of the 12-in. (about 100 yards) must be in 9 ft. lengths.

Full particulars, and weights of same, with list of connections required, may be obtained from the Company's Engineer, Mr. Alfred Penny, 20, Abingdon Street, Westminster, after Wednesday, the 2nd of April.
Tenders to be sent, on or before the 17th of April, addressed to the Chairman, EDWYN CRONK, Esq., SEVENOAKS.

TO CONTRACTORS AND OTHERS.

THE Sevenoaks Gas Company are desirous of receiving TENDERS for a Brick GAS HOLDER TANK, 83 ft. in diameter, and 20 ft. deep also a Retaining Wall, to be erected at their Works at Sevenoaks.
Plans, specifications, and bills of quantity of same, will be ready for inspection after Saturday next, April 5, and may be seen at the Office of the Company, in Sevenoaks, or at the Office of their Engineer, Mr. Alfred Penny, No. 20, Abingdon Street, Westminster, from whom copies of lithographed specification and bills of quantities may be obtained, price 5s.
Tenders to be sent in on or before the 17th day of April, addressed to the Chairman, EDWYN CRONK, Esq., SEVENOAKS.
The Directors do not bind themselves to accept the lowest or any tender.

ULVERSTON LOCAL BOARD.

GAS AND WATER DEPARTMENT.

THE Gas and Water Committee invite TENDERS for the Supply of 1200 Tons of COAL and 250 Tons of CANNEL for Gas purposes; to be delivered in such quantities and at such stated periods as may be required during the 12 months ending June 30, 1880.
The Coal and Cannel offered are to be the best of their kind, and must be as free as possible from all bats, pyrites, and dirt.
Parties tendering must give full particulars of the Coal and Cannel offered, and the colliery from which they propose to supply, and state the price per ton delivered, carriage paid, to Ulverston Station.
Where a tender is received for the supply of both Coal and Cannel, it must be understood that the Committee is to be at liberty to accept a portion of such tender.
Sealed tenders, addressed to the undersigned, will be received until the 5th of April.
JNO. SWAN, Engineer and Manager.
March 22, 1879.

ULVERSTON LOCAL BOARD.

GAS AND WATER DEPARTMENT.

THE Gas and Water Committee invite TENDERS for the Purchase of the Surplus TAR and AMMONIACAL LIQUOR Manufactured at their Works for a period of One, Two, or Three years, commencing July 1, 1879.
The quantity of Tar to be disposed of annually will be about 100 tons, and of Ammoniacal Liquor 160 tons.
Contractors to state price per ton at these Works for both Tar and Liquor (the Liquor to be of 6 degrees Twaddell), and the extra price they are prepared to give for every additional degree, as tested by Twaddell's Hydrometer.
Sealed tenders, addressed to the undersigned, will be received until the 5th of April.
JNO. SWAN, Engineer and Manager.
March 22, 1879.

TENDER FOR NEW RETORT-BENCH.

THE Town Commissioners for Bandon are desirous of receiving PLANS, SPECIFICATIONS, and TENDERS for a new BENCH OF RETORTS, to be erected complete, with new Hydraulic Main, Mouth-Pieces; Bridge, Dip, and Ascension Pipes; Furnace Doors, and all Fittings complete, and ready for making Gas.
The retort-house is 26 feet inside walls, and in that space they would require one setting of nine retorts, one setting of six retorts, and two settings of three retorts each, in all 21 retorts.
Tenders to include all materials and carriage, and to be lodged with me on or before Saturday, the 5th of April next.
The work to be subject to the approval of such person as the Town Commissioners may select.
S. R. TRESILIAN, Clerk to Town Commissioners.

NEWPORT (MON.) GAS COMPANY.

TO CONTRACTORS.—EXTENSION OF TIME.

THE Directors of the above Company invite TENDERS for the Supply and Erection of a Set of three PURIFIERS (each 15 ft. by 12 ft.), with Centre-Valve and all Connections complete, at the Gas-Works, Newport (Mon.).
Further particulars may be had, and drawings and specification examined, in the Office of the undersigned. Copies may be had under certain conditions.
Sealed tenders, addressed to the Chairman of the Company, to be forwarded not later than April 17, 1879.
The Directors do not bind themselves to accept the lowest or any tender.
By order,
THOMAS CANNING, Engineer.
Gas-Works, Newport (Mon.), March 29, 1879.

BOROUGH OF FROME WATER-WORKS.

CONTRACTS NOS. 4 AND 5.

THE Local Board for the District of Frome, acting as the Urban Sanitary Authority, are prepared to receive TENDERS for the Execution of the following Works at or near Frome, in Somersetshire:—
Contract No. 4.—The Erection of Engine and Boiler Houses, Chimney Stack, Coal Store, Cottage, &c.
Contract No. 5.—The Construction of a Covered Reservoir (to contain about half a million gallons), with other works connected therewith.
Specifications and forms of tender, as well as bills of quantities, can be obtained (on payment of one guinea for each contract, which will be returned on receipt of a *bonâ fide* tender), and drawings can be seen at my Office in Frome, or at the Office of the Engineer, Mr. Henry Tomlison, 4, Bene't Street, Cambridge.
Sealed tenders, endorsed respectively "Tender for Engine House, &c.," or "Tender for Reservoir, &c.," as the case may be, must be delivered to me not later than Twelve o'clock at noon on Tuesday, the 15th day of April next.
By order,
GEO. W. BRADBURY, Clerk.
Local Board Offices, Bath Street, Frome,
March 26, 1879.

THE Hampton Court Gas Company have FOR SALE, One 40 ft. by 16 ft. GASHOLDER, with six Cast Columns and Wrought Girders, to be Sold very cheap, as the position is wanted.
Also the following PLANT, the whole of which is in excellent condition, having been removed for larger:—
One 8-horse Power Vertical Engine.
One 20,000 ft. Beale's Exhauster.
One 15,000 do. do.
Two Beale's Slide-Valves.
Two Waller's Disc-Valves.
One 8-in. Bye-Pass Valve.
One 20-in. diameter Exhaust Governor.
Three Riggers.
One 3-in. Cast-Iron Pump, Fowler's make.
One 2-in. do. do.
Driving Gear for the two Pumps.
One 3-in. Brass Valve Pump, with Driving Gear.
One Cast-Iron Scrubber, 12 ft. high by 5 ft. 6 in. diameter, with 8-in. connections.
Three 8-in. Donkin's Valves, 8-in. Pipes, Bends, &c., for connections.
Two Small Washers and Connections.
For further information, apply to MR. E. PRICE, Engineer and Manager, Gas-Works, HAMPTON WICK.

SWANWICK CANNEL.

Illuminating power, 24 candles. Good Coke, 11¼ cwt. to the ton.
For analysis, prices, and references, apply to
H. BOAM, Litchurch Villa, DERBY.

BRAY'S
NEW BURNERS.
40, 50, 60, 70, and 80
CANDLE POWER.

See Page 497.

TO COAL MERCHANTS.

THE Directors of the Horsham Gas Company, Limited, in Sussex, invite TENDERS for a Supply of COALS for One year, commencing May 1, 1879.

The Coals to be either Pelaw Main, Holmside, or Peltons.

The quantity required will be from 100 to 250 Tons per month, as may be ordered.

The Coals to be delivered at the Horsham Railway Station, carriage paid, and to be paid for within Two months of the date of delivery.

Sealed tenders, endorsed "Tender for Coals," to be sent to the undersigned on or before Saturday, April 12.

ROBERT SHEPPARD, Secretary.

TENDERS FOR GASHOLDER.

THE Directors of the Dover Gaslight Company invite TENDERS for the construction of One Lift of a Telescopic GASHOLDER, 82 ft. diameter, and 24 ft. deep, with Standards, &c., at their Buckland Works, drawings and specifications of which can be seen, and form of tender obtained, at my Office, or at the Office of their Engineer, Mr. T. N. Kirkham, 21, Abingdon Street, Westminster, any day after the 27th of March inst., between the hours of Ten and Four.

The party whose tender may be accepted will be required to enter into a contract with two sureties for the due performance of the works.

The Directors do not bind themselves to accept the lowest or any tender.

No tender will be received unless it is made upon one of the Company's printed forms, marked "Tender for Gasholder," and delivered at my Office, 14, Snargate Street, Dover, on or before Eleven o'clock a.m., on Saturday, April 12, 1879.

G. FIELDING, Secretary.

ARMAGH GASLIGHT COMPANY, LIMITED, IRELAND.

THE Directors of the above Company are prepared to receive TENDERS for the Erection of four PURIFIERS, 8 ft. square by 4 ft. deep, inside measure, with 12 in. Water Lute for Covers, four sets of Wood Grids in each, and Centre-Valve complete.

Each tender to contain a Tracing of Purifiers, Valve, &c.

The Directors do not bind themselves to accept the lowest or any tender.

Sealed tenders to be lodged with me not later than the 21st of April next.

By order,
JOSEPH GIBB, Manager.

Gas-Works, Armagh, March 20, 1879.

GAS COAL.

THE MIRFIELD COAL COMPANY are supplying GAS COAL of the best quality on trucks at their siding. This Coal contains 10 per cent. of Cannel, and, as analyzed by Mr. James Paterson, of Warrington, yields 12,600 *cubic feet of 16·67 candle gas, with* 1430 *lbs. of good Coke, per ton.* Ash in Coke, 1·88.

Apply to the MIRFIELD COLLIERY, Mirfield, NORMANTON.

TO ENGINEERS & MANAGERS.—CLIFTON'S

PATENT COKE AND COAL BARROW

Is acknowledged to be the best Barrow in the Market.

For particulars, with Drawings and Prices, apply to the Sole Makers,

THORNELOE & COMPANY,
ENGINEERS AND CONTRACTORS,
57, BARBICAN, LONDON, E.C.

THE HYDRAULIC MAIN ENTIRELY SUPERSEDED.

AN increased yield of gas, and of augmented illuminating power, is obtained by employing WHITE'S AUTOMATIC VALVE, and dispensing with the Hydraulic Main, the tar of which, as is well known, absorbs the rich constituents of the gas consequently, diminishes alike the quantity and quality.

Further particulars, &c., upon application to WILLIAM WHITE, Gas-Works, Aberaychan, MON.

A Pamphlet descriptive of the above method, post free, 6½d.

Price 28s., handsomely bound in Morocco, cloth sides, gilt edged and lettered.

THE FIRST VOLUME
OF
KING'S TREATISE

On the Science and Practice of the Manufacture and Distribution of

COAL GAS.

Edited by THOS. NEWBIGGING, C.E., M.Inst.C.E., and W. T. FEWTRELL, F.C.S.

Orders received by
WALTER KING, 11, Bolt Court, Fleet Street, London, E.C.

Prices, half bound, cloth sides, 2 quires, 30s.; 3 quires, 36s.; other sizes and bindings to order.

THE
GAS COMPANIES
EXPENDITURE JOURNAL,

Being a Ruled Account-Book with Printed Headings, and Analyzing Guide for Keeping, upon the easiest and most correct method, the Expenditure of a Gas Company, in accordance with the provisions of the Gas-Works Clauses Act of 1871, and suitable for all Companies.

Specimen, with illustration and full particulars; 2s. 6d. returned on the purchase of a "Journal."

Published by EDWARD SANDELL, Accountant, 2, Great George Street, WESTMINSTER, and W. KING, Office of the JOURNAL OF GAS LIGHTING, 11, Bolt Court, FLEET STREET, E.C.

GAS *v.* ELECTRIC LIGHT.

WIGHAM'S PATENT GAS-BURNERS
FOR
STREET LIGHTING, &c.

Speaking of these burners, erected on the Thames Embankment by Westminster Bridge, the *Daily News* says:

". . . . . A blaze of light is thrown out, which, in point of efficiency and brilliancy, far surpasses the large gas-lamps lately erected in Waterloo Place, *while even the electric lights are quite thrown into the shade.*"

SOLE MANUFACTURERS:
J. EDMUNDSON & CO., GAS ENGINEERS,
19, GREAT GEORGE STREET, WESTMINSTER, LONDON, S.W.

J. BEALE'S NEW PATENT GAS EXHAUSTERS,
MANUFACTURED SOLELY BY
B. DONKIN & CO.

These Exhausters have but one solid slide, which ensures less wear and tear, and less friction, and thus fewer repairs are necessary. They are made with two outside bearings and all latest improvements.

MESSRS. B. D. & CO. ALSO MAKE

STEAM-ENGINES FOR DRIVING GAS EXHAUSTERS,
VALVES FOR GAS, WATER,
STEAM, HYDRAULIC MAIN, TAR, AMMONIACAL LIQUOR, &c.

WORKS: 55a, BLUE ANCHOR ROAD, BERMONDSEY, LONDON, S.E.

RETORT BOLTS,
AND ALL KINDS OF
BOLTS AND NUTS,
SUITABLE FOR
GAS-WORKS,
SUPPLIED BY
JOHN STANSFELD,
Bolt & Nut Manufacturer,
ALFRED ST., BOAR LANE, LEEDS.

ECONOMY IN THE PRODUCTION OF GAS.

PLUTONIC CEMENT,

FOR JOINTING AND REPAIRING RETORTS AND OVENS *in* ACTION AND *out* OF ACTION.

A Pamphlet on the advantages of the above, with Modes of Application, References, Prices, &c., free by post, from the Sole Manufacturer,
WILLIAM RICHARDSON, Gas and Hydraulic Engineer, CHARLES HENRY STREET, and BISSELL STREET, BIRMINGHAM.

Now Ready, Price One Guinea,

PRECEDENTS IN PRIVATE BILL LEGISLATION
AFFECTING GAS AND WATER UNDERTAKINGS.

COMPILED BY MR. G. W. STEVENSON, C.E., F.G.S.

This Work contains information with regard to the practice of Parliament during the last fourteen years, in regard to most of the points on which differences arise in Opposed Bills for Gas and Water Undertakings, comprising—Authorized share and loan capital, Rates of dividend, Capitalization of profits, Term for the repayment of loans, Instances in which new shares are to be sold by auction and Exceptions to the Standing Order requiring new shares to be sold by auction, The limitation of back dividends, Illuminating power, Purity, Price, Notice before testing, The conditions under which the public supply of gas is regulated, Alteration of mains, Instances in which maps of mains are required, and All cases in which undertakings have been transferred, since 1845 in gas and 1865 in water, from Companies to Local Authorities.

In the Water Precedents will be found, in addition, The rates for a supply for domestic purposes, and the Rates for other than domestic purposes.

LONDON: WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

PRICE'S PATENT COKE & COAL BARROW

effecting a great saving of time, labour, and expense.

For particulars, price, &c., apply to Mr. E. PRICE, Inventor and Patentee, Gas-Works, Hampton Wick, MIDDLESEX.

Prices are Reduced.

BELGIAN CLAY RETORTS.

J. SUGG and CO., late ALBERT KELLER, GHENT.—The removal of the import duties on Earthenware permitting the entry of Clay Retorts into England, Messrs. Sugg, of Ghent, beg to draw the attention of the Gas Companies of London, and other Cities, to the very superior quality of the RETORTS manufactured by them. They can be made of any size, in one piece, and of any form. The price will be in proportion to the weight, and very moderate in comparison to their value.

Communications addressed to J. SUGG & Co., GHENT, will receive immediate attention.

CLOTH GAS-BAGS FOR MAINS,

As supplied to the Imperial, Chartered, and other London and Provincial Gas Companies. Bellows and Valves for inflating Well Dresses, Stokers Gloves, India-Rubber Suction and Delivery Hose, Gas-Tubing, Leather, India-Rubber, and Gutta-Percha Machine-Bands, Sheet and Washers, and Steam Joints.

T. BUGDEN, Manufacturer,
107, GOSWELL ROAD, LONDON, E.C.

JAMES NEWTON & SONS,
(Established 1820,)
FIRE-BRICK AND TILE MERCHANTS,
Wholesale and for Exportation,
FALCON DOCK, 78 AND 79, BANKSIDE,
SOUTHWARK, LONDON, S.E.,
DEPÔT for STOURBRIDGE AND NEWCASTLE FIRE-BRICKS, LUMPS, TILES, and FIRE-CLAY, and every Article suitable for
GAS AND WATER WORKS.

J. & H. ROBUS,

BUILDERS AND CONTRACTORS

FOR THE ERECTION AND REBUILDING OF GAS AND WATER WORKS,

RETORT-SETTING—A SPÉCIALITÉ.

ROBUS'S IMPROVED RETORT-SETTINGS, guaranteed to Carbonize a large amount of Coal with a small per cent. of Fuel.

ESTIMATES GIVEN FOR MAIN-LAYING.

N.B.—All kinds of Fire Goods and Gas Apparatus supplied on the shortest notice.

Address:—J. & H. ROBUS, BELL GREEN, CATFORD, LONDON, S.E.

Now ready, Second Edition, price 7s., by post 7s. 3d., the

GAS MANAGER'S HANDBOOK.

By THOMAS NEWBIGGING, M.I.C.E.

Orders to be sent to

WALTER KING,

11, BOLT COURT, FLEET STREET, LONDON, E.C.

PATENT

MACHINE-MADE RETORTS.

B. GIBBONS, JUN.,

STOURBRIDGE.

GAS COAL. GAS COAL. GAS COAL.

WELLS, BIRCH, RYDE, and CO., Limited,

HOYLAND SILKSTONE COLLIERIES,

Near BARNSLEY.

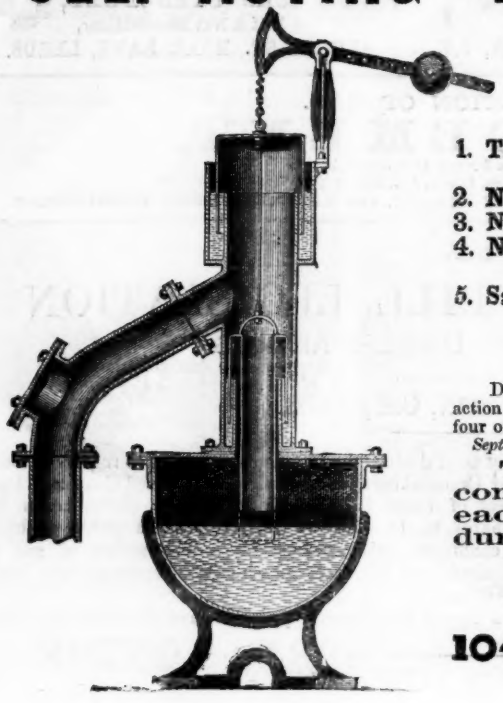
This Company is now in a position to raise **2000 tons per day of REAL OLD SILKSTONE GAS COAL.**

"The quality of this Coal for Gas purposes, if equalled, is not excelled by any on record, and the Coke competes successfully with best Durham."—See *Mining Journal*, Aug. 11, 1877.

Prices quoted to any Railway Station, or F.O.B. Hull, Grimsby, Goole, Keadby, Liverpool, and Fleetwood.

Full particulars will be sent on application to above address.

SELF-ACTING REMOVABLE DIP-PIPE,



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CHANDLER & STEVENSON.

ADVANTAGES.

1. There is no pressure on the Retorts.
2. No deposit of Carbon.
3. No scurfing is required.
4. Never a choked Ascension-Pipe.
5. Saves Fuel and Wear and Tear.
6. Gets 10 per cent. more Gas out of the Coal, and a higher Illuminating Power.
7. Is never out of order.
8. Requires no attention.
9. Is perfectly automatic in its action.

Testimonial from the Proprietor of the Apeldorn Gas-Works.

DEAR SIR,—In reply to your inquiry, the Self-Acting Dip-Pipes, which have been in action at my works for two years, give entire satisfaction. I forward you order for four others.

Yours truly,

Sept. 9, 1877. R. BAKKER.

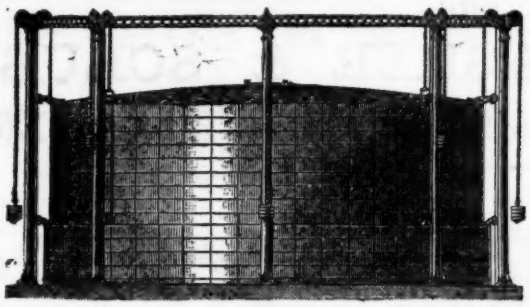
These Dip-Pipes can now be supplied complete, except the flanched bend, for £4 each, which includes the charge for licence during the whole term of the patent.

APPLICATIONS TO BE MADE TO

Messrs. CHANDLER & SONS,

104, NEWINGTON CAUSEWAY, S.E.,

Who fix the Dip-Pipes, at a small Charge, when required.



J. T. B. PORTER & CO.,

GAS ENGINEERS & MANUFACTURERS,

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GOWTS BRIDGE WORKS,

LINCOLN.

LONDON OFFICES: 1, WESTMINSTER CHAMBERS, S.W.

ESTIMATES FOR GAS-WORKS OF ANY SIZE.

REFERENCES TO 500 WORKS ALREADY ERECTED.

N.B.—All Communications to be addressed to the FIRM ONLY.

FURNACE BUILDER AND RETORT SETTER.

W. HAILES Contracts for the Erection of Retort Benches, Settings of Retorts on all the most improved principles, in large or small works. Twenty years experience both in London and Provinces. Price List on application.

Address 3, High Street, Brentford, MIDDLESEX.

WANTED, by Samuel Thompson & Co., Colliery Office, Lancaster, APPLICATION for PRICES from Gas Managers who are prepared to receive Tenders for GAS COAL or CANNEL.

John Leigh, Esq., M.R.C.S., F.C.S., &c., &c., in his analytical report of S. T. & Co.'s Coal, says: "It is remarkable for its purity, I have scarcely ever examined a Coal containing so small a quantity of ash, and when Cannel of the best description is scarce, it may well replace this material."

HOPKINS, GILKES, & CO.,

LIMITED,

MIDDLESBOROUGH,

SUPPLY GAS & WATER PIPES of EVERY SIZE.

Plain, Turned and Bored, and Coated.

CAST-IRON RETORTS.

Castings for Gas-Works of every description.

EXHAUSTERS.

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SCOTCH CANNEL COALS.

The Subscriber is prepared to contract for the supply of all the principal SCOTCH CANNEL COALS. Prices and Analyses of the various Coals will be forwarded on application.

JAMES M'KELVIE,

CANNEL COAL MERCHANT,

HAYMARKET, EDINBURGH.

Established 1840.

HYDRATED PURIFYING MATERIAL.

Samples onapplication.

MESSRS. SPENCE BROS., LIMITED,

Will be glad to supply the above on the most favourable terms, and to treat, by Purchase or Exchange, for Spent Oxide.

PRICES ON APPLICATION.

ALSO PATENT DRY COPPERAS FOR EXTRACTING AMMONIA.

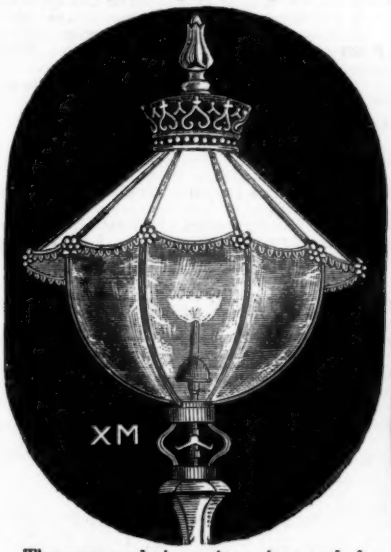
VICTORIA CHEMICAL WORKS, BRADFORD, NEAR MANCHESTER.

IMPROVED REFLECTING STREET-LAMPS.

D. HULETT having had numerous inquiries for an **Improved Street-Lamp**, begs to call the attention of **Gas and Railway Companies, Local Authorities, and others** to his **Improved Reflecting Lamps**, which are constructed to give the greatest amount of light from the quantity of gas consumed.

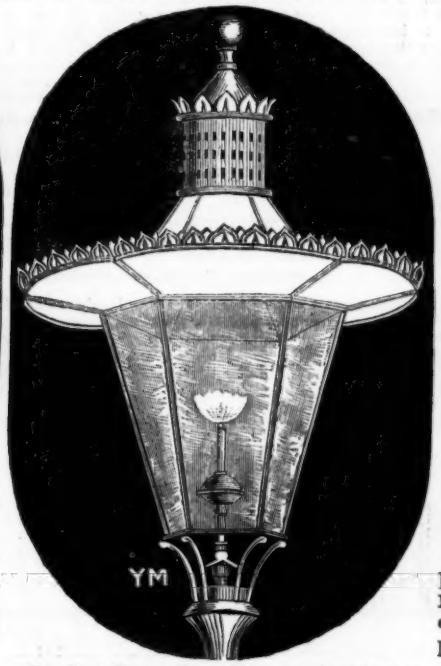
They are strongly recommended for **Railway Platforms and large open spaces**, or any places requiring a good light at a comparative small cost for gas.

The 14-inch square Lamp is made to fit the ordinary Lamp-Cradle now in use, and is fitted with a 24-inch Reflector.



They are made in various sizes and designs—circular, hexagonal, or square.

Where Argand burners are preferred, these Lamps are constructed with effectual Wind-Guards.



Special attention is called to our **Duplex Gas Burner with Mercurial Governor.** By this arrangement a considerable increase in the illuminating power of the gas consumed is obtained.

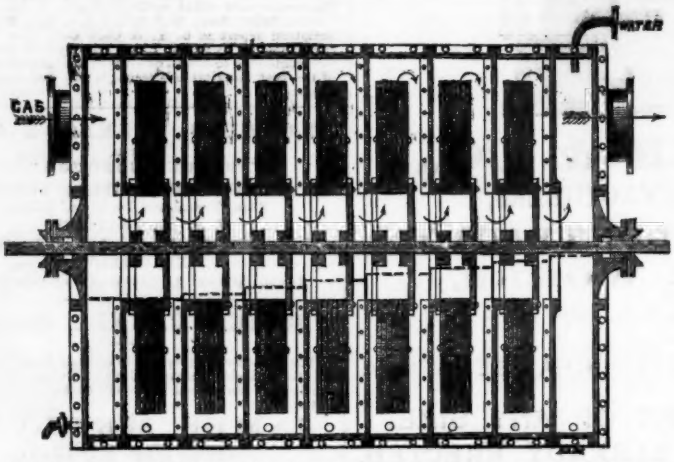
Further Particulars upon application to

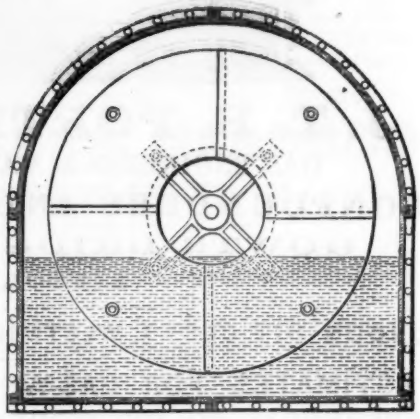
D. HULETT, 55 and 56, HIGH HOLBORN, LONDON.

THE

"STANDARD" WASHER & SCRUBBER.

[KIRKHAM, HULETT, AND CHANDLER'S PATENT.]





This Washer and Scrubber has been used for nearly two years on a large scale at the Works of The Gaslight and Coke Company, Bromley-by-Bow, at which station there are now several in operation and in course of construction. There is also one in use at the Pancras Station, King's Cross, of the same Company, which is purifying 1,500,000 cubic feet of gas per day. At the Gas-Works of the Corporation of Leeds, a large one has been erected, which is giving complete satisfaction. The Special Merits of this Washer are as follows:—

That it is a very effective Condenser, so that it is not absolutely necessary to reduce the temperature of the gas to 60°, or thereabouts, to make the Washer effective.

That the distribution of the liquor is made with unerring regularity.

That it occupies very small space, so that it can be, at little expense, effectually protected from extreme changes of the weather.

That the considerable expense of Coke or Wood, or other Scrubbing Material, is entirely saved, and that the great nuisance and cost of from time to time replacing the Scrubbing Material is avoided.

That, by the revolution of the discs, the quantity of water carried up by them, and tending continuously to fall, exposes a very large amount of fresh wetted surface to contact with the gas.

That it is particularly adapted for Gas-Works where Sulphate of Ammonia is manufactured.

That it is much cheaper than any other Scrubber that will do the same amount of work effectually.

That it is the only Washer suitable for purifying Gas from all its impurities by solution.

That it works with a minimum of pressure.

That it takes out every trace of Ammonia from the Gas in once traversing the machine.

That it requires very little outlay for foundations.

The following Testimonials show the opinion of eminent Engineers as to the capabilities of the Washer:—

(Copy.) *The Gaslight and Coke Company*
Bromley-by-Bow, May 3, 1877.

D. HULETT, Esq.

Dear Sir,—In answer to your inquiries respecting the results of the working of your Patent Washer, I beg to state that I find it a very efficient machine. I have had it in operation for some time, and passed gas through it continuously at the rate of 100,000 cubic feet per hour, and obtained from it 11 gallons of 10 oz. liquor per ton of coal carbonized—results which appear to me very satisfactory for so small a Washer. It works very smoothly, taking but little power, and giving no pressure. I have it still in operation, and am perfectly satisfied with its working.

I am, dear Sir, yours truly, (Signed) W. B. WRIGHT.

(Copy.) *The Leeds Corporation Gas-Works,*
York Street, Leeds, Dec. 6, 1878.

Messrs. KIRKHAM, HULETT, and CHANDLER.

Gentlemen,—The Scrubber-Washer erected by you at these works, and which has been in use for six months, has proved to be, so far as we have been able to test it, thoroughly efficient. We are at present making 32,000 feet of gas per hour, and are entirely dependent on this apparatus for the removal of Ammonia, and the **Gas is perfectly free from that impurity in the sixth chamber,** so that four chambers remain to deal with an increasing make of gas. Owing to insufficient condensers, the gas was in the summer admitted to the Scrubber at a temperature of 70°, but was reduced therein to 61°, or that of the atmosphere. The volutes are driven at the rate of four revolutions per minute, and, working at that speed, there is not the slightest difference between the inlet and the outlet pressure. Clean water supplied at the rate of 10 gallons per ton of coal carbonized is converted into liquor of from 10 oz. to 13 oz. strength **in once traversing the vessel.** The apparatus is extremely simple and compact, occupies but little space, and requires no foundation. I shall be surprised if it does not eventually become extremely popular.

I am, Gentlemen, yours faithfully, (Signed) HENRY WOODALL, Engineer.

(Copy.) *The Gaslight and Coke Company.*
York Road, King's Cross, Jan. 14, 1879.

Messrs. KIRKHAM, HULETT, and CHANDLER.

Gentlemen,—In reply to your inquiry, I am pleased to say, the Washer which was put in action at this station in October last has quite fulfilled my expectations, as it confirms the experiments I made in May last with the smaller machine. Working at four revolutions per minute, **it takes out every particle of Ammonia,** while purifying more Gas than it was intended to do. I enclose particulars of a fortnight's working during our heaviest make, by which you will see that it yields the full quantity and strength of liquor, and works with little pressure. I am therefore quite satisfied with the machine, and trust it may meet with the success it deserves.

I remain, Gentlemen, yours truly, (Signed) JOHN CLARK.

The following Table shows the results of the working of one of these Washers, lately erected to purify 60,000 *feet of Gas per Hour, at the St. Pancras Station of The Gaslight and Coke Company:—*

1879.	Nos. of the Divisions and Strength of Liquor in each.										Water used per Ton of Coals.	Gas Purified per Hour, Cubic Feet.	Ammonia on Outlet.	Temperature.			Pressures.		Revolutions per Minute.
	1	2	3	4	5	6	7	8	9	10				Inlet.	Outlet.	Atmosphere.	Inlet, Inches.	Outlet, Inches.	
	oz.	oz.	oz.	oz.	oz.	oz.	oz.	oz.	oz.	oz.									
January 1	8½	6¾	5	3½	2½	1½	¾	¼	0	0	10 Gallons.	52,000	Nil.	77°	73°	48°	24	23	7½
,, 2	8¾	7	6	4½	3½	2¼	1½	½	¼	0	10 ,,	57,000	Nil.	73°	68°	32°	21¾	20½	4
,, 3	9½	8	6	3¾	3	2¼	1½	¾	¼	0	10 ,,	60,000	Nil.	75°	68°	40°	23½	22	4
,, 4	9¾	7¾	6¼	4¼	3¼	2¼	1½	¾	¼	0	10 ,,	65,000	Nil.	74°	68°	33°	24	22½	5
,, 5	9¾	7	6	4	3	2¼	1½	1	¼	0	10 ,,	34,000	Nil.	77°	68°	35°	14½	14	5
,, 6	9¼	7½	6¼	4¼	3	2¼	1½	1	¼	0	10 ,,	63,000	Nil.	72°	66°	27°	24	22½	4½
,, 7	11	9	7	5¼	3¾	3	1½	1¼	¼	0	10 ,,	59,000	Nil.	74°	66°	31°	25	23½	5
,, 8	9½	7½	6	4½	3	2	1	¾	¼	0	10 ,,	78,000	Nil.	73°	61°	31°	28	26¼	4½
,, 9	11	9	7	5	3½	2½	1½	1	¼	0	10 ,,	82,000	Nil.	74°	67°	33°	27½	25½	5
,, 10	10½	8½	6½	5	3½	2½	1½	1	¼	0	10 ,,	66,000	Nil.	76°	64°	28°	28½	27	5
,, 11	12½	10	7½	5½	4½	3½	1½	1½	¼	0	10 ,,	61,000	Nil.	73°	64°	27°	26½	25½	5
,, 12	11	8½	6½	—	—	—	1½	1	¼	0	10 ,,	80,000	Nil.	74°	64°	27°	26½	25½	5
,, 13	13	10½	8¼	6	4½	3½	2	1½	¼	0	10 ,,	78,000	Nil.	75°	65°	42°	28	26	5

(Signed) JOHN CLARK, Engineer.

For further particulars and testimonials, address

Messrs. KIRKHAM & HERSEY, GAS ENGINEERS, 21, ABINGDON STREET, WESTMINSTER.

REPORT

OF THE

BUENOS AYRES OLD GAS COMPANY.

December 31st, 1878.

GENTLEMEN,

The profits obtained in the past year amount to 4,690,608 dols. m/c. The disposable part of this sum was delivered to the Shareholders, distributing 20 per cent. in the proportion which belonged to them.

The establishment, in all its branches, continues to follow the system it has so long adopted, which produces the result held in view at its commencement.

The question with the Municipality, to recover the sum due, awaits the decision of the Tribunal. Nevertheless, we hope to arrive at last at an arrangement both equitable and satisfactory to all.

The panic in England caused by the telegram from Mr. Edison, announcing his having solved the problem relative to the distribution of electric light, and thus being able to light private houses, has disappeared. Many competent persons deny this possibility, showing, by the European papers, the grounds on which they found their opinion; but many others who accept the discovery, believe that difficulties must arise to prevent for many years its use in private houses.

The Company, seeing the gravity and importance of this event, and to guard the interests confided to their care, gave Mr. Louis Wilde, our Agent in Europe, the orders and instructions necessary to place us in a position to know exactly the proceedings, and to gather from the gentlemen who dedicate themselves to the study, their opinions concerning the divisibility of the electric light.

On other occasions we have shown that our profits from the sale of materials, &c., almost amount to nothing, and that we have to conform to the rules of other companies, which affects this branch of our business.

In the meeting of 1873, the Directive Commission was requested to take the measures which their judgment considered necessary to advance our business. The Directors were, and are persuaded that, properly conducted, there is room for two companies in this city. Taking this view of the affair, for the last five years we have gone on without making any movement which could be considered as a reprisal of the constant hostility shown us. It is necessary not to confound hostility with competition, which is natural and indispensable between companies dedicated to the same object. We compete by giving excellent gas at a relatively lower price, the proof being that we keep the same number of consumers in spite of the efforts made to take them from us.

But the Company sees, in the distance, movements which, under different forms, may be attempted to ruin this Company; and this was held in view at the starting of the other companies.

If such steps should be attempted, we assure the Shareholders that the Directive Commission will have recourse to no means which may lower the importance of this Company, or affect the decorum and dignity of the persons who constitute the Directory. We should adopt powerful measures sufficiently effective to combat and destroy all such obstacles, whatever be their nature and importance.

The sale of articles in the departments of the works and pipes, the use of the funds dedicated to the works, and the millions owed by the Municipality, place the Company in a position to dispose of 22,000,000 dols. m/c., giving it a powerful weapon which can be used in its own defence.

For the next ten years our gas can be sold at cost price, giving, at the same period, to the Shareholders, an annual dividend of 12 per cent.

Limiting the time to five years, the gas could be sold 50 per cent. less than the cost, still giving the above dividend. It might be objected that this could not be continued if the funds for the work should come to an end. To this we reply: First, we broach the idea to make it more clearly understood. It is easy to see that two years would be more than sufficient to obtain our triumph; and even in the event of reaching the end of the specified time, the Society would go on in virtue of being firmly constituted, and perfectly accredited both at home and abroad.

It is well known that the first *usina*, by its want of capacity and some apparatus, was not sufficient to make the quantity of gas necessary for the consumers; it is equally well known that there was a deficit in the Company's capital, and it was to all appearance ruined.

The Shareholders know that if the money had not been forthcoming to extricate it from the situation in which it was, the Company would have proved a total loss.

Nevertheless, the Directory was able to establish a new *usina*, extend the pipes through the streets, and raise the establishment to the flourishing condition it has been in for years, and at the same time give a dividend of 254 per cent., represented by two new shares and the rest in money. If it were possible then to restore a ruined company without credit of any kind or assistance, with how much more reason will it continue to work, now that it is perfectly established, and accredited at home and abroad. The Shareholders may rest assured that, in whatever emergencies which may arise, the Directive Commission will show the energy and firmness necessary, proceeding, nevertheless, with that moderation and circumspection which is already its characteristic.

A. FAIRLIE WILSON,

CONSULTING GAS ENGINEER,

34, ST. GEORGE'S ROAD, SOUTHWARK, S.E.

Reports and Valuations in the Management, Construction, and Structural Value of Gas-Works.

HENRY LYON (14 years Engineer and Manager of the largest of the Manchester Corporation Gas-Works) Mechanical and Consulting Gas Engineer, reports upon the condition and value of Gas-Works, supplies plans and specifications of all Apparatus appertaining to Gas-Works, and re-models existing Works.

Address Brooklyn, near Halliwell Lane, Cheetham Hill Road, MANCHESTER.

W. LIDDALL,

Public Accountant,

MOORGATE STREET CHAMBERS,

GREAT SWAN ALLEY,

MOORGATE STREET, E.C.

Mr. ROBERT DEMPSTER,

CONSULTING GAS ENGINEER,

ELLAND, near HALIFAX,

May be consulted on all matters connected with Valuations, Arbitrations, and Parliamentary Applications connected with Gas-Works. Having been engaged on extensive Arbitration Cases, which, combined with his experience in Construction and Contracting, his knowledge of Engineering and Valuations is both extensive and reliable.

ALFRED LASS,

SPECIAL ACCOUNTANT FOR GAS COMPANIES,

30, GRACECHURCH STREET, LONDON.

Accounts analyzed and Statistics Prepared for Parliamentary Proceedings, Arbitrations, &c.

The Forms of Account, which have been specially designed to meet the requirements of the Gas-Works Clauses Amendment Act, 1871, are now in use by many Gas Companies, and have been universally approved.

The above forms are registered.

Water Companies Accounts also prepared and adjusted.

CONSULTATIONS.

TORBAY AND DART PAINT COMPANY, LIMITED.

WORKS:

DARTMOUTH & BRIXHAM (TORBAY) DEVON.

OFFICES:

23, GREAT GEORGE STREET, WESTMINSTER LONDON, S.W.

SOLE PROPRIETORS AND MANUFACTURERS OF

WOLSTON'S CELEBRATED

TORBAY IRON PAINTS.

TRADE MARK

These Paints have been for many years extensively used in Her Majesty's Royal Dockyards, Woolwich Arsenal, the Shorncliffe and Curragh Camps, War Departments, and Colonies, and are largely supplied to Railway, Harbour, and GAS COMPANIES, Shipowners, Engineering Establishments, Railway Carriage and Wagon Works, and the Paint Trade generally. They are the BEST PROTECTORS of WOOD, CEMENT, and IRONWORK, even arresting corrosion after it has set in; and their base being oxide of iron, they are free from those properties which make lead paints so destructive to iron. They do not scale or blister, are not affected by great heat, and are the only Paints which will resist the effects of sulphuretted hydrogen. Their DURABILITY and covering properties have borne the test of A QUARTER OF A CENTURY'S PRACTICAL TRIAL.

The undermentioned colours—ground in best linseed oil, and requiring only to be thinned down for use in the ordinary way—are kept in stock:—

Torbay Brown.	Torbay Red.
Dart Green.	Slate.
Dart Yellow.	Buff.
Brixham Black.	Torbay Chocolate.
Light Blue.	Cream Colour.
Dart Brown.	Dart Umber.
Imperial Stone.	Light Stone.
Bronze Green.	Salmon Colour.
Navy Green.	Lead Colour.
Carriage Red.	Dark Stone.
Light Lead.	Crystal Palace Blue.
Light Green.	Iron Grey.

All other Colours made to order.

READY-MIXED PAINTS.

A great variety of Colours ready mixed for the brush are also always kept in Stock, in 3 lb., 7 lb., 14 lb., and 28 lb. cans.

Prices and Testimonials on application.

JOHN HALL AND CO., STOURBRIDGE,

Manufacturers of FIRE-BRICKS, LUMPS, TILES,

AND EVERY DESCRIPTION OF FIRE-CLAY GOODS.

N.B.—A Stock of 15 and 16 in. CIRCULAR RETORTS always on hand. Other kinds made to order on short Notice.

BEST GAS COALS

DIRECT FROM THE

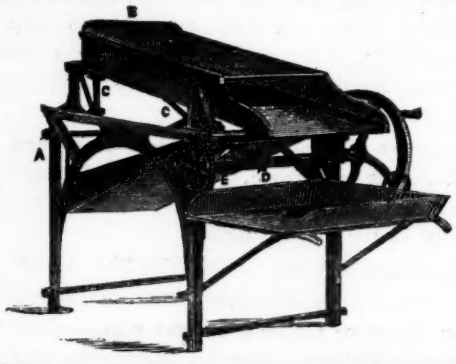
MARQUESS OF LONDONDERRY'S COLLIERIES.

COUNTY OF DURHAM.

For Prices and Particulars, apply to

MR. S. J. DITCHFIELD,

LONDONDERRY OFFICES, SEAHAM HARBOUR, COUNTY OF DURHAM.



PRICE'S PATENT

LABOUR-SAVING SCREEN OR SIFTER.

In screening breeze, the coarse material falls on a tray supported by the handles of the Machine, thus making it convenient for picking the clinkers from the same, whilst the fine falls on a shoot behind, which is fixed to the bottom of the sieve B. In screening gravel or other material, the coarse will fall into a barrow direct, and the fine be conveyed by the shoot into a barrow at the other end, or at the bottom.

To practical men the advantages of this Machine will be evident. It secures at once a saving of time, labour, and expense, as by it a much greater quantity of material can be sifted in the same space of time.

Further particulars as to price, &c., may be obtained by applying to the Patentee (Hampton Wick), or to

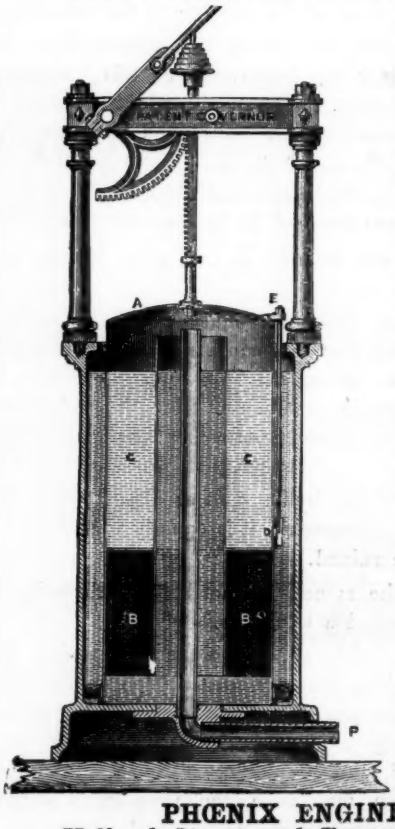
ROBERT DEMPSTER & SONS,
(SOLE MANUFACTURERS),
ELLAND, NEAR HALIFAX.

GEORGE WALLER & CO.,

GAS AND HYDRAULIC ENGINEERS,

Patent Compensating Steam Governor,

WITH SELF-CONTAINED WATER-BALANCE.



DESCRIPTION OF THE APPARATUS

The illustration represents a section of the Patent Governor. The lower part of the Bell A is fitted with a loose Float B, and in the upper part of the Bell is a deep annular Water Chamber C, at the bottom of which is an opening D, with a slide outside regulated by a Screw Spindle E to allow the water to pass in and out of the Chamber C quickly or slowly, according to circumstances, but when once adjusted the slide does **not require altering.** This Self-compensating Chamber gives great steadiness to the up and down movement of the Bell and effectively prevents the "hunting" motion so common with other Governors, thereby ensuring a more perfect action on the throttle-valve of the Engine **than attained by any other.** The sketch shows the clip lever fixed to work on throttle-valve at an angle, and can work in either direction. P is the Gas Inlet-pipe to Governor.

G. W. & Co. also make **special Steam Throttle Valves,** suitable for working with this Governor, and alter existing Throttle Valves to same plan.

PHŒNIX ENGINEERING WORKS,
Holland Street and Bear Gardens, Southwark, S.E.

F. & C. OSLER,

45, OXFORD STREET, LONDON, W.

MANUFACTORY AND SHOW-ROOMS:

BROAD STREET, BIRMINGHAM.

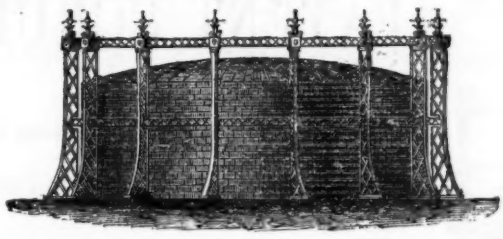
ESTABLISHED 1807.

MANUFACTURERS OF CRYSTAL GLASS CHANDELIERS.

WALL LIGHTS, AND LUSTRES FOR GAS AND CANDLES.

TABLE GLASS OF ALL KINDS.

CHANDELIERS IN BRONZE AND ORMOLU. MODERATOR LAMPS.



THE HORSELEY COMPANY,

LIMITED,

TIPTON, STAFFORDSHIRE.

LONDON OFFICE:

6, WESTMINSTER CHAMBERS, VICTORIA STREET,

GAS ENGINEERS, IRONFOUNDERS, &c.,

MANUFACTURERS OF

GASHOLDERS, WROUGHT AND CAST IRON TANKS, CONDENSERS, PURIFIERS, SCRUBBERS, MAINS, RETORT-LIDS, PLAIN AND DISHED LAMP-POSTS, PIPES,

AND ALL REQUISITES FOR EITHER

GAS OR WATER WORKS;

ALSO

MAKERS OF ROOFS, BRIDGES, &c.

S. OWENS & CO.,

WHITEFRIARS STREET, LONDON, E.C.,

HYDRAULIC ENGINEERS,

AND MANUFACTURERS OF

PUMPING MACHINERY of every Description.

SOLE LICENSEES AND MANUFACTURERS FOR GREAT BRITAIN OF

BLAKE'S PATENT STEAM-PUMPS,

More than 10,000 in use,

ESPECIALLY ADAPTED FOR USE IN GAS AND CHEMICAL WORKS, FOR PUMPING TAR, WATER, AMMONIACAL LIQUOR, ACIDS, &c.

The following are some of the prominent advantages of the BLAKE PUMP:—

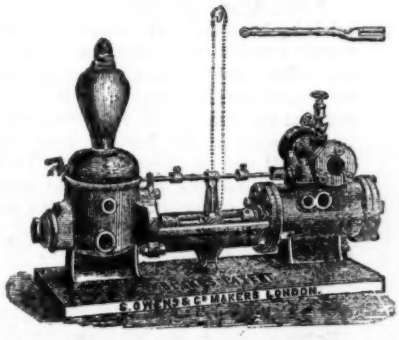
It will start at any point of stroke.

It has no dead point.

It works fast or slow, with the same certainty of action.

It is economical. Has a lead on the slide-valve.

It is compact and durable.



It is interchangeable in all its working parts.

It will deliver more water than any other pump.

It is made of best materials in the most workmanlike manner.

Can be worked at 20 strokes per hour, or 200 strokes per minute.

This Illustration represents Boiler-Feed Pumps, Sizes Nos. 1, 2, and 3, with Hand Lever for working Pump when Steam is not available.

SOLE MANUFACTURERS OF

MANN & OWENS

IMPROVED PATENT GAS-VALVES.

PRICED LISTS AND FULL PARTICULARS FURNISHED ON APPLICATION.

T. NEWBIGGING,

CONSULTING GAS ENGINEER,

5, NORFOLK STREET, MANCHESTER.

THOMAS CARR & SON,

MANUFACTURERS OF

FIRE-BRICKS, LUMPS, TILES, RETORTS, &c.,

COTSWOOD FIRE-BRICK WORKS, SCOTSWOOD-ON-TYNE.

Also Makers of all kinds of Common Building Bricks, and of Pressed White and Red Bricks for Facing.

BIRTLEY IRON WORKS,

CHESTER-LE-STREET, DURHAM.

Manufactory for every description of Casting and Machinery for Gas-Works and Water-Works.

Warehouse in London for Cast-Iron Pipes and Connexions of all sizes and in any quantity, Scott's Wharf, Bankside, Southwark.

Agent in London, Mr. J. MANWARING, 101 Cannon Street, E.C.

JAMES OAKES & CO.,

ALFRETON IRON-WORKS, DERBYSHIRE,

AND

WENLOCK IRON WHARF, 21 & 22, WHARF ROAD, CITY ROAD, LONDON, N.,

Keep in London and at their works large stocks of PIPES and CONNEXIONS (1¼ to 36 inches in diameter); also make and supply Retorts, Tanks, Columns, Girders, Special Castings required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

CHARLES HORSLEY, Agent.

THE

SILICA FIRE-BRICK CO.,

OUGHTIBRIDGE

Near SHEFFIELD,

Manufacturers of THE ORIGINAL SILICA OR DINAS FIRE-BRICKS. Specially adapted for Gas-Retort Furnaces and for Siemens's Gas-Furnaces. Shipments promptly executed to London, Liverpool, Hull, Grimsby, &c.

PORTBURY, PATERSON, & CO.,

MANUFACTURERS OF

Improved Wet and Dry Gas-Meters,

ALSO PATENTEES OF

COMPENSATING WET METERS;

INDICATORS,

STATION AND TEST METERS TO ORDER

STREET-LAMPS AND FITTINGS.

WORKS: WATERBEER ST., EXETER.

TROTTER, HAINES, & CORBETT,

BRETTELL'S ESTATE

FIRE CLAY & BRICK WORKS,

STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASS-HOUSE FURNACE & BLAST-FURNACE BRICKS LUMPS, TILES, and every description of FIRE-BRICK.

Proprietors of

BEST GLASS-HOUSE POT and CRUCIBLE CLAYS.

Successors to

E. BAKER AND CO., LATE BRIERLEY HILL, STAFFORDSHIRE.

HARPER & MOORES,

PROPRIETORS OF THE

BEST STOURBRIDGE CLAYS,

STOURBRIDGE.

Manufacturers of all Descriptions of

BEST STOURBRIDGE FIRE-BRICKS, LUMPS AND CLAY RETORTS

Of all Dimensions for Gas-Works,

GLASS-HOUSE POTS & CRUCIBLES

ESTABLISHED 1836.

The Highest Award was obtained by H. & M., at the Philadelphia Exhibition, 1876, for Superior Quality of Manufacture. SILVER MEDAL, PARIS, 1878.

GAS AND WATER PIPES.

WILLIAM MACLEOD & CO.,

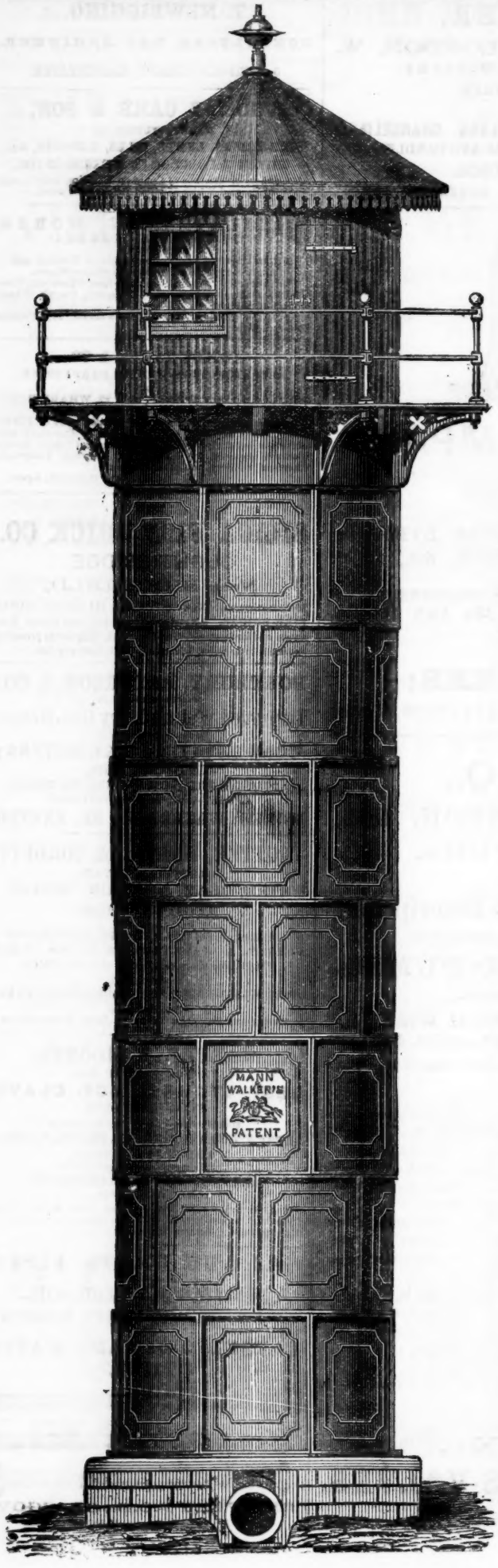
23 & 25, OSWALD STREET, GLASGOW.

CAST-IRON GAS AND WATER PIPES.

DELIVERY F.O.B., GLASGOW

Prices on application.

C. & W. WALKER,
8, Finsbury Circus,
London, E.C.



MANN & WALKERS' PATENT SCRUBBER.

By Letters Patent in Great Britain, Europe, and the United States of America.

By some important improvements recently patented, the purifying power of these Scrubbers has been much increased, and a stronger ammoniacal solution obtained, which is found to absorb a large portion of the carbonic acid contained in gas, effecting an important saving in money and labour in the lime purifiers, and where oxide only is used, the increase in the illuminating power of the gas obtained by these Scrubbers is shown in a remarkable degree, in consequence of the large quantity of carbonic acid removed from the gas.

It is to be particularly noted that the im- portant results of these Scrubbers do not depend upon the machinery alone. The entire internal construction of the Scrubber bears an almost equally important part. For this reason, where it is desirable to convert existing Scrubbers, whose dimensions happen to be suitable, the work commences by ripping out the whole of the interior of the shell, and beginning the internal construction *de novo* from bottom to top.

Fifty million cubic feet of gas per 24 hours are purified from ammonia by these Patent Scrubbers in a winter's day in the gas-works of London, where the purity of gas supply is the highest in the world, under the chemical restrictions of the Board of Trade.

Generally, wherever a high standard of purification is maintained in the chief cities and towns of the British Provinces and of Europe, these Scrubbers have become established.

By their use the department of purification from ammonia upon a gas-works is made complete, without the aid of prepared oxide of iron, chemicals in purifiers, or any other supplementary process, and the whole ammoniacal residual product contained in the coal is absorbed and obtained in the form most profitable to a gas company, while the requirements of all Acts of Parliament and of the Board of Trade, relating to incorporate gas companies, are satisfied.

Foul Gas, properly condensed, entering the inlet is, by once only passing through the Scrubber, completely purified from ammonia with regular certainty day by day, without any further trouble, or any other process, effected by a very small quantity of clear water let into the machinery room at the top of the Scrubber, which is discharged at the liquor outlet at the bottom, from Newcastle coal at about 18 to 20 ounces strength, from Yorkshire and other coals, generally from 25 to 30 ounces strength; while acidulated litmus or turmeric exposed at the Scrubber outlet will not show the slightest discoloration, and there is not a quarter of a grain of ammonia per 100 feet left unabsorbed.

They contain their own engine power, requiring only a small inappreciable quantity of steam from the gas-works boiler, and are then complete in themselves, ready for service.

Applications relating to dimensions and prices should be addressed to us, C. and W. Walker, 8, Finsbury Circus, London, E.C., or to Mr. William Mann, late Superintendent of the Chartered Gas-Works, Blackfriars, London; they should state approximately the largest make of gas in 24 hours on a winter's day, and the smallest make on a summer's day, to be purified.

BRAY'S

"STANDARD"

FLAT-FLAME BURNERS.

(PATENT SLIT UNIONS.)

LIGHTING POWER—40, 50, 60, 70, and 80 CANDLES.

In consequence of the demand for Burners of extra Power for Lighting Large Spaces, we have introduced Burners of the above lighting power, which give from TWELVE to TWENTY per Cent. more light per cubic foot of gas consumed than any Flat-Flame Burner hitherto introduced.

Photometrically, with 16-candle gas, our New Standard Burners yield a result equal to the best Argands of similar consuming power; while, *in actual use*, we are prepared to demonstrate a yield of light 20 per cent. *superior* to the best Argands. With 20-candle gas and upwards, the *photometrical* superiority is greatly in favour of our New Burners.

FOR STREET-LAMP PURPOSES there is no liability of the lamps being filled with carbon by a governor getting out of order, as will be the case where Argands are used; and, as they are lighted in the ordinary way, there is no necessity to keep a small jet burning all day in order to light the Burner at night.

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HARTHILL CANNEL

Yields 14,920 cubic feet of 40·92-candle gas per ton.

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12,530 cubic feet of 40·22-candle gas per ton, and 9 cwts. of good coke.

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Yields 12,500 cubic feet of 34-candle gas per ton, and 9 cwts. of excellent coke, containing only 4 per cent. of ash.

MUIRKIRK, No. 1, CANNEL

Yields 12,160 cubic feet of 32·5-candle gas per ton, and 10 cwts. of excellent coke, containing only 5 per cent. of ash. This cannel is almost free from sulphur.

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Yields 13,220 cubic feet of 32·5-candle gas per ton.

Prices and full analyses on application at above address, or from WEDDERSPOON, FERGUSSON AND CO., 21, Lime Street, LONDON, E.C.

GAS COAL.

POPE & PEARSON, LIMITED, have now the authority of several of the most eminent Gas Engineers of London in stating that their Coal yields *in practical working over* 10,000 *cubic feet of gas, with an illuminating power of* 16 *candles;* or by the standard burners now used by the London Gas Companies, an illuminating power equal to 17½ candles.

One ton yields 12½ cwt. of good coke. This Coal can be shipped from Hull, Goole, Liverpool, Morecambe, and Barrow.

For further particulars, apply to POPE AND PEARSON, LIMITED, West Riding and Silkstone Collieries, near LEEDS.

HEBBURN MAIN GAS COALS.

T. Stone, Esq., of Weymouth, writes on Nov. 17, 1876: "I have used about 12,000 tons of this Coal, with, I think, the best possible results, although not always under the most favourable circumstances. My Coal account made up to Midsummer last showed a makeage of 10,524 cubic feet per ton of 14½-candle gas, and not a hundredweight of Cannel used. This statement would, I know, be incredible to many men, and may provoke the remark, 'How much of it is paid for?' For the gratification of such, I have to say that, of the above quantity, 9866 cubic feet per ton of Coal carbonized were brought to charge and duly paid for, with the exception of about 6s. per cent. for bad debts. The coke is of excellent quality. The above facts I hold to be a greater recommendation to your Coal than any words of mine could be."

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At the request of Mr. Hedley, the owner of the Holmside Colliery, I have much pleasure in stating that, for about ten or twelve years past, this Company has taken at least half of its supply of Newcastle Coal from him. I can, therefore, confidently bear testimony to the good quality of the Holmside Coals, and consider they are equal to the best of the Newcastle Coals, in proof of which I may state that this year we are using those Coals exclusively, that the yield of Gas is from 9700 to 9800 feet per ton, and that the quality of the Gas, without any admixture of Cannel, is over 16 candles, as tested by the officer appointed by the Metropolitan Board of Works, using the London Gas Referees test.

The Coke is of excellent quality, and in quantity amounts to about 40 bushels from a ton of Coal.

The annual consumption of Coal amounts to about 75,000 tons.

GEORGE LIVESEY, Engineer and Secretary.

P.S.—I am at this date, Feb. 15, 1875, still using Holmside Coals as largely as ever, and am quite as well pleased with them as when I gave the above certificate.

GEORGE LIVESEY.

We are this year, 1878, using 80,000 tons of Holmside Coal. GEORGE LIVESEY.

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A negotiations respecting M. Brémond's patented process for preventing Deposits of

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in Gas Main and Service Pipes should be addressed to Mr. W. H. BENNETT, 22, Great George Street, WESTMINSTER, S.W., or to M. BREMOND, Gas Engineer, Compania Madrilena de Alumbrado y Calefaccion por Gas, MADRID, who may be consulted upon all matters connected with the Gas Industry.

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Analyses and Quotations on application.

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RETORT SETTINGS—giving great Economy of Fuel.
STEAM-ENGINES and EXHAUSTERS, FOUR-WAY VALVES, WASHERS, SCRUBBERS.
FUEL-MACHINE, for Compressing Breeze and Tar.

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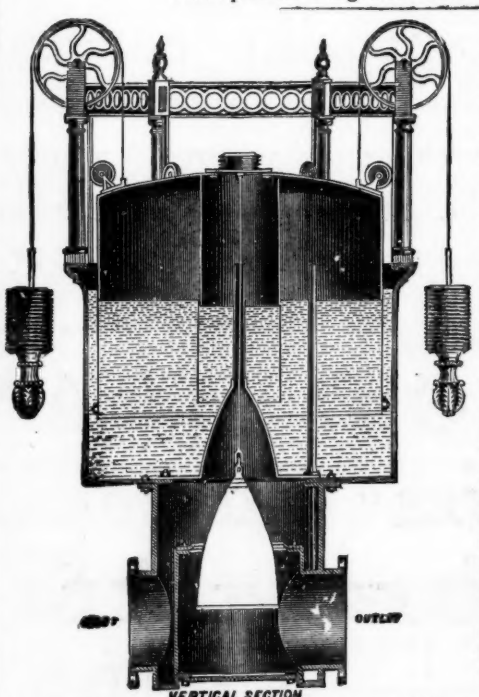
J. & J. BRADDOCK,
GLOBE METER-WORKS,
OLDHAM,

Beg to submit to Gas Engineers their

PATENT COMPENSATING GAS GOVERNOR,

Which is designed to give an uniform pressure at the Outlet to the Main at all draughts up to the full quantities which the Governors are made to control, such outlet pressure being less than the initial pressure.



VERTICAL SECTION

The uniformity of pressure is obtained by introducing a compensating chamber into the Bell or Holder of the Governor, which compensator is of the same area as the valve, both of which are operated on by the initial pressure, thereby placing the valve in equilibrium, no matter what the initial pressure may be. The action on the Bell is by the Gas passing along a pipe from the outlet, and the pressure is regulated by weights in connexion with the Bell as required.

From the sectional elevation attached hereto, it will be seen that only the Gas required to operate the Bell comes in contact with the water of the tank, which water will remain comparatively sweet and free from odour. That in case of accident to the Bell, no more Gas can escape than would pass up the pipe covering the valve-rod and Bell supply-pipe.

These Governors have been made and sent out of various sizes for from 2 to 24-inch Mains, and give most satisfactory results.

They can be made with Float in the Bell, or counterpoise as per section.

THE SILKSTONE & DODWORTH COAL & IRON COMPANY, LIMITED,

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REAL OLD SILKSTONE GAS COAL.

JAMES PATERSON Esq., Gas Engineer, of the Warrington Gas Company, reported, Aug. 10, 1875:—

"This Coal possesses remarkable qualities as a gas and coking coal, and appears SECOND TO NONE IN THE KINGDOM. It contains the large quantity of 699 lbs. of illuminating matter, and 1498 lbs. of coke to the ton, and produces **12,240** cubic feet of 16·66 candle gas."

The above Company are raising nearly a thousand tons of the Real Old Silkstone Gas Coal per working day.

PRICES QUOTED TO ANY RAILWAY STATION, OR F.O.B. HULL, GRIMSBY, GOOLE, KRADBY, LIVERPOOL, AND FLEETWOOD.

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Are Buyers of SULPHATE AMMONIA in Large or Small Quantities, or Sell on Commission for Gas Companies and Makers.

PLANT ERECTED ON THE LATEST AND MOST APPROVED PRINCIPLE.

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PARIS EXHIBITION, 1878.

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SILVER MEDAL
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Being the Highest Honour given for this class.

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SPECIAL NOTICE.—Our Patent Machine-Made Retorts have now been thoroughly tested, and have proved themselves infinitely superior to those made by hand. At several large works it has been settled, beyond question, that, owing to the compactness and general excellence, more gas is sent to the gasholder from each ton of coal carbonized than is the case with hand-made Retorts.

NEWTON, CHAMBERS, & CO.,

THORNCLIFFE IRON-WORKS AND COLLIERIES,
NEAR SHEFFIELD.

CELEBRATED SILKSTONE GAS COALS.

The various descriptions of Gas Coal produced from the above Collieries possess an unequalled reputation, combining in a large degree the constituents essential for the production of the best quality of Coke and Gas of a high illuminating power.

A recent extensive development of the Collieries enables us to offer increased supplies.

JAS. PATERSON, Esq., of Warrington, after testing various qualities of our Coal, has sent the following testimony of their merits:—

"*Warrington Gaslight and Coke Company,*
Offices, Mersey Street, Warrington, April 23, 1877.

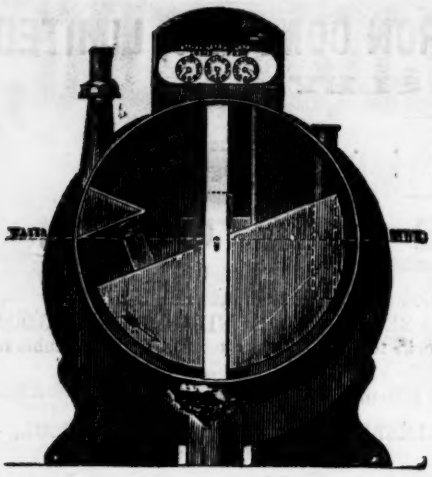
"MESSRS. NEWTON, CHAMBERS, AND CO.,

"GENTLEMEN,—After carefully testing the various samples of Gas Coals sent from your Collieries for analysis, I have pleasure in reporting them as belonging to the highest class of Gas and Coking Coals.

"The average of Nine samples gives a yield of **12,500** cubic feet of **15½**-Candle Gas, being equivalent to **664** lbs. of sperm per ton, and **1420** lbs. of fixed carbon of a very superior quality. All the samples bear a close relation to each other in value.

"Yours truly,
"JAMES PATERSON."

Full particulars will be sent on application to us—address as above.



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Over 120,000 in action.

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IMPROVED DRY GAS-METERS, in Cast-Iron or Tin-Plate Cases;

STATION-METERS, ALL SIZES, up to 15 feet Square, with PLANED JOINTS;

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Effecting a great saving in the cost of discharging Coals from Vessels, Barges, &c. Several of these Cranes, with the necessary power, are now being erected at the Beckton Gas-Works.

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For LIFTING RAILWAY WAGGONS to RETORT-HOUSE STAGEWAY; CAPSTANS for HAULING WAGGONS, &c.,

HYDRAULIC APPARATUS for Lifting and Lowering Purifier-Covers.

Sixteen recently erected at Beckton, applied to Covers 30 feet square.

GAS AND WATER PIPES, ROOFING, BOILERS, &c.

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